SEW EURODRIVE

MOVITRAC® 07 Communication

Edition

06/2003

Manual

10565310 / EN

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1 Important Notes

- **This manual does not replace the detailed operating instructions!**
- **Installation and startup only by trained personnel observing applicable accident prevention regulations and the MOVITRAC® 07 operating instructions!**

Documentation

- Read this manual carefully before you install or operate the MOVITRAC® 07 frequency inverter with communication link.
- We assume that you are familiar the the MOVITRAC® 07 system manual prior to reading this manual.
- Consult the existing documentation. It is a prerequisite for trouble-free operation and fulfillment of any warranty claims.

Bus systems

General safety notes on bus systems:

This communication system will make it possible for you to match the MOVITRAC® unit to the specifics of your application. As with all bus systems, there is a danger of invisible, external (as far as the inverter is concerned) modifications to the parameters, which give rise to changes in the inverter behavior. This may result in unexpected (not uncontrolled, though!) system behavior.

Safety and warning notes

Observe the safety and warning notes contained in this documentation!

Electrical hazard
Possible consequences: Severe or fatal injuries.

Hazard
Possible consequences: Severe or fatal injuries.

Hazardous situation
Possible consequences: Slight or minor injuries.

Harmful situation
Possible consequences: Damage to the unit and the environment.

Tips and useful information.

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2 Introduction

The units of the MOVITRAC® 07 series are available in standard and LOGODrive design.

Units in standard design can only be operated as slaves. The master functions are not available in this unit.

2.1 Technical data

System Bus (SBus)

Standard	CAN specification 2.0 parts A and B
Baud rate	either 125, 250, 500 or 1000 kbaud, factory setting 500 kbaud
ID range	0 ... 2047
Address	can be set with parameter P813: 0 ... 63
Number of process data words	fixed setting: 3 PD
Cable length	depending on the baud rate, max. 320 m
Number of stations	max. 64

2.2 MOVILINK® and system bus

MOVILINK® profile

The MOVILINK® profile is an SEW-specific profile.

The MOVILINK® profile makes for the data exchange between a higher-level master and several SEW inverters. Masters may take the form of programmable logic controllers, PCs or even SEW inverters with PLC functions (units with IPOS$^{plus®}$ or UFx fieldbus gateways). SEW inverters usually function as slaves in the bus system.

The MOVILINK® profile offers the following functions:

- Automation
  - Drive control
  - Parameter setting of the drives
- Startup
- Visualization

The MOVILINK® profile does not depend on any specific transmission medium. This fact makes the functions described in the MOVILINK® profile available for serial transmission as well as transmission via a fieldbus system.

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Features

The MOVILINK® profile has a range of functions comparable to other fieldbus systems, such as:

- PROFIBUS
- INTERBUS
- CANopen
- DeviceNet

The MOVILINK® profile offers the following functions:

- Access to all drive parameters and functions in SEW inverters. The profile will help you manage the following tasks:
  - Startup
  - Service
  - Diagnostics
  - Visualization
  - Automation
- In addition, the MOVILINK® profile offers the following services:
  - Fast process data exchange
  - Comprehensive parameter access
  - Network management
- The MOVITOOLS startup and diagnostic tools use the MOVITOOLS® profile for communication with the inverter.

System bus (SBus)

The SBus is a CAN bus according to the CAN specification 2.0, parts A and B. The SBus supports all services offered by the MOVILINK® SEW unit profile. In addition, you can exchange IPOS$^{plus®}$ variables via the SBus regardless of the profile.

MOVITRAC® 07 offers digital access to all drive parameters and functions via the SBus. The SBus controls the inverter via the fast process data.

You can specify the following setpoints with the process data telegrams:

- Setpoint speed
- Integrator time
- Acceleration/deceleration

You can specify the following drive functions with the process data telegrams:

- Enable
- Controller inhibit
- Standard stop
- Rapid stop

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You can read back the following actual values from the inverter with the process data telegrams:

- Actual speed
- Current
- Unit state
- Error code
- Reference signals

You can generate applications with the MOVILINK® profile that store all important drive parameters in the higher-level automation device. This setup eliminates the need for manual parameter setting of the inverter.

IPOS$^{plus®}$ provides the MOVLNK command to exchange parameter and process data with other MOVILINK® stations. As a result, MOVITRAC® 07 can operate as the master via IPOS$^{plus®}$ and control other units. Only LOGODrive units can serve as masters.

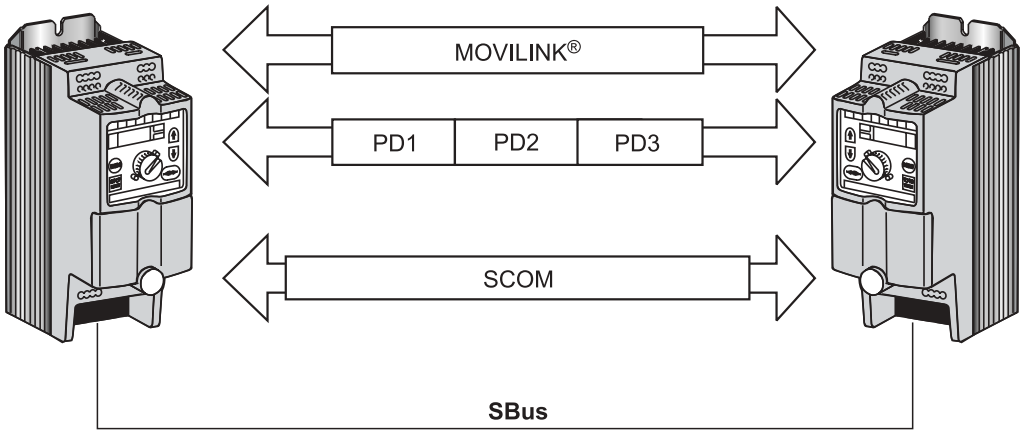

Figure 1: Variants of SBus communication

Using the SBus requires additional monitoring functions such as time monitoring (SBus timeout time) or special emergency off concepts.

The MOVITRAC® 07 inverter offers numerous diagnostic options for startup and service purposes.

The MOVITOOLS software offers a more convenient diagnostic option:

You can set all drive parameters and display the bus and unit status in detail with the SHELL and STATUS programs.

You can monitor the data exchange with the bus monitor or use the control mode to preset the data exchange.

Variable telegrams

The cyclical and acyclical exchange of variables via SBus offers an interface for the exchange of variables between several MOVITRAC® 07 units. You can also perform profile-specific partial implementations for non-SEW units. These non-SEW units may support the CANopen or other protocol.

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2.3 Fieldbus

You can use the UFx11A fieldbus gateways to integrate the MOVITRAC® 07 into the following fieldbus systems:

- PROFIBUS-DP
- INTERBUS
- DeviceNet
- CANopen

You can connect several inverters to the UFx11A fieldbus gateway via the SBus. The UFx11A fieldbus gateway connects the fieldbus and SBus.

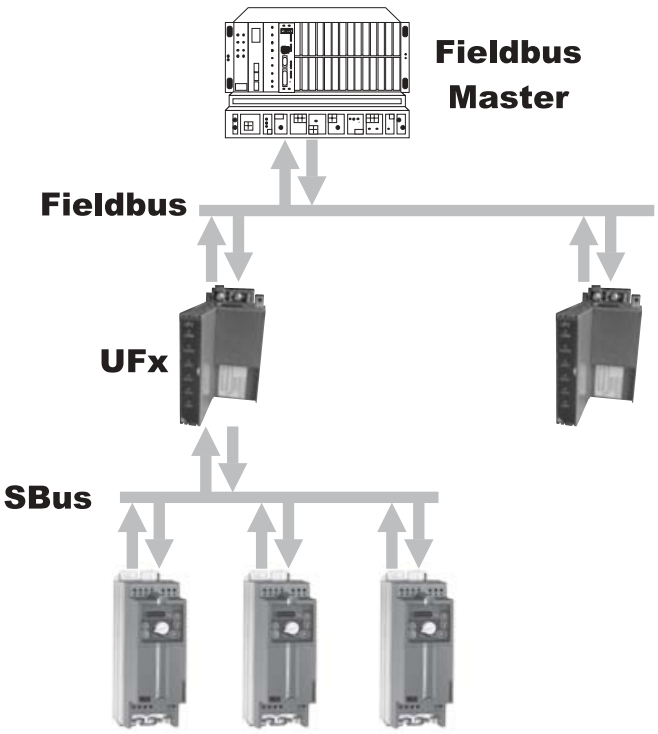

Figure 2: System overview fieldbus master – UFx11A – inverter

3 Installation

3.1 System bus (SBus) installation

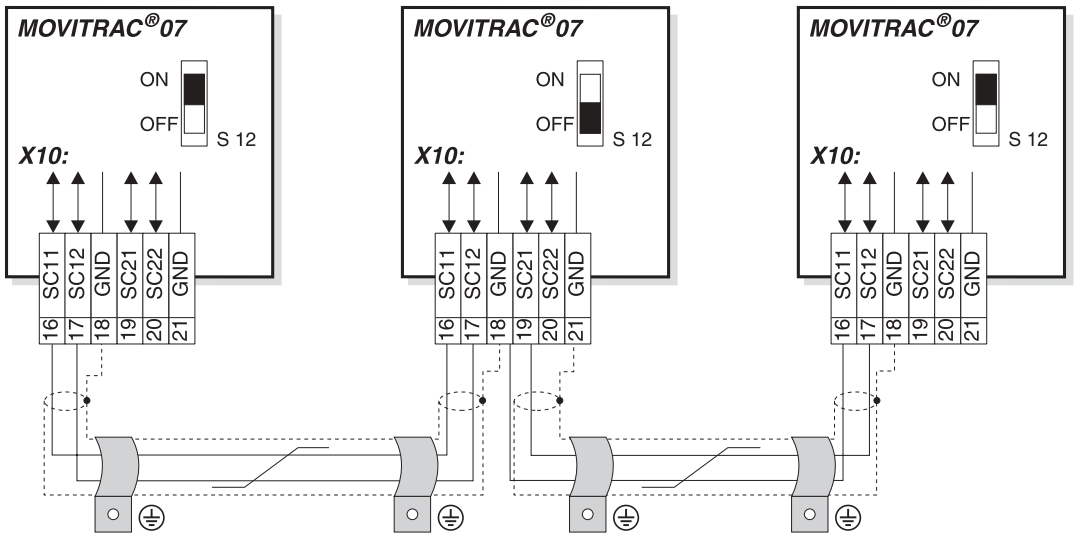

Figure 3: System bus connection MOVITRAC® 07

S12 = System bus terminating resistor
SC11 = System bus high
SC12 = System bus low
SC21 = System bus high
SC22 = System bus low
GND = System bus reference

SBus MOVITRAC® 07: Connect the communication terminals to SC11/SC12. SC21/SC22 is only active when S12 = OFF.

Cable specification

- Use a 2-core twisted and shielded copper cable (data transmission cable with shield comprising copper braiding). The cable must meet the following specifications:
  - Cable cross section 0.75 mm^2 (AWG 18)
  - Cable resistance 120 Ω at 1 MHz
  - Capacitance per unit length ≤ 40 pF/m (12 pF/ft) at 1 kHz

  Suitable cables include CAN bus or DeviceNet cables.

Shield contact

- Connect the shield at either end to the electronics shield clamp of the inverter or the master control and ensure the shield is connected over a large area. Also connect the ends of the shield to GND.

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Cable length

- The permitted total cable length depends on the baud rate setting of the SBus (P816):
  - 125 kbaud → 320 m (1,056 ft)
  - 250 kbaud → 160 m (528 ft)
  - **500 kbaud → 80 m (264 ft)**
  - 1000 kbaud → 40 m (132 ft)

Terminating resistor

- Switch on the system bus terminating resistor (S12 = ON) at the start and end of the system bus connection. Switch off the terminating resistor on the other units (S12 = OFF).

- There must not be any potential displacement between the units connected using the SBus. Take suitable measures to avoid a potential displacement, such as connecting the unit ground connectors using a separate lead.

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4 System Bus Communication Slave

4.1 Data exchange with a slave via MOVILINK®

Communication via MOVILINK® incorporates the data exchange of parameter and process data telegrams. The MOVITRAC® 07 unit can communicate as master or slave in this process. Only LOGODrive units can serve as masters.

As slave, the unit can receive and answer parameter and process data messages via the SBus.

Communication with a master control works with different telegrams types. These types of telegrams can be divided into two categories:

- Process data telegrams
- Parameter telegrams

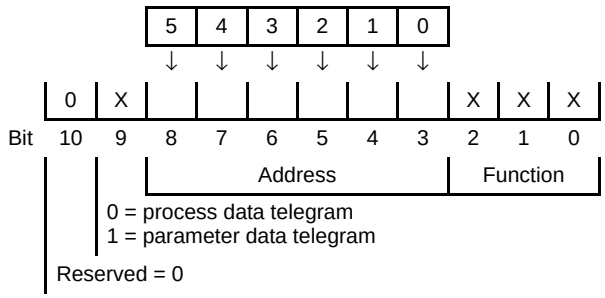
CAN bus identifier

On the SBus, it is necessary to differentiate between these various types of telegrams by means of the identifiers (ID). You create the ID of an SBus telegram by indicating the telegram type and the SBus address. Set the SBus address using parameters P813 or P814. P813 is the SBus address while P814 is the SBus group address.

The CAN bus identifier consists of 11 bits. The 11 bits of the identifier form three groups:

- Function (bits 0 ... 2)
- Address (bits 3 ... 8)
- Process data/parameter data switch (bit 9)

Table 1: CAN identifier for SBus in MOVILINK® profile



Bit 9 distinguishes between process and parameter data telegrams. Bit 10 is reserved and must be 0. The address of parameter and process data telegrams includes the SBus address (P813) of the unit that is addressed by a request; the address of group parameter and group process data telegrams includes the SBus group address (P814).

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Creating the identifiers

The following table shows the relationship between the type of telegram and the address when creating the identifiers for SBus MOVILINK® telegrams:

Identifier	Telegram type
8 × SBus address + 3	Process output data telegram (PO)
8 × SBus address +4	Process input data telegram (PI)
8 × SBus group address + 6	Group process output data telegram (GPO)
8 × SBus address + 512 + 3	Parameter request telegram
8 × SBus address + 512 +4	Parameter response telegram
8 × SBus group address + 512 + 6	Group parameter request telegram

Process data telegrams

Process data telegrams are comprised of a process output and a process input data telegram. The process output data telegram is sent from the master to a slave; it contains the setpoint values for the slave. A process input data telegram is sent from the slave to the master after receipt of the process output telegram; it contains the actual values of the slave.

The fixed setting for the number of process data is "3 process data words."

The resulting CAN telegram always includes 6 byte user data.

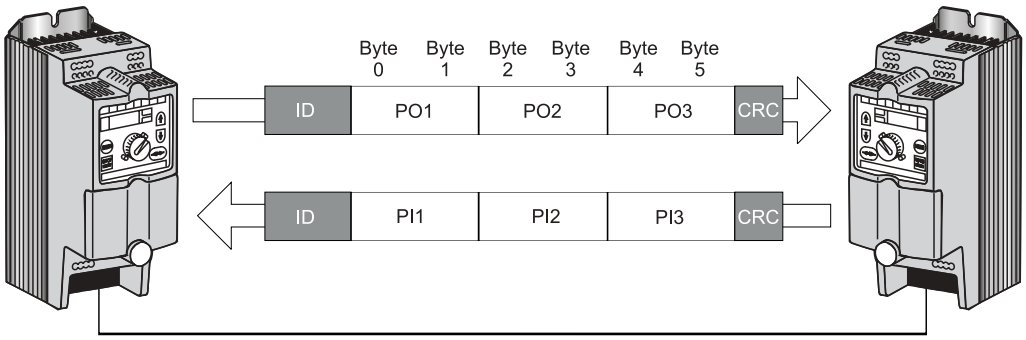

Figure 4: Process data telegrams

Group process data telegram

The group process data telegram is sent from the master to one or more slaves with the same SBus group address. Its structure is the same as the process output data telegram. Use this telegram to send the same setpoint values to several slaves that share the same SBus group address. The slaves do not respond to the telegram.

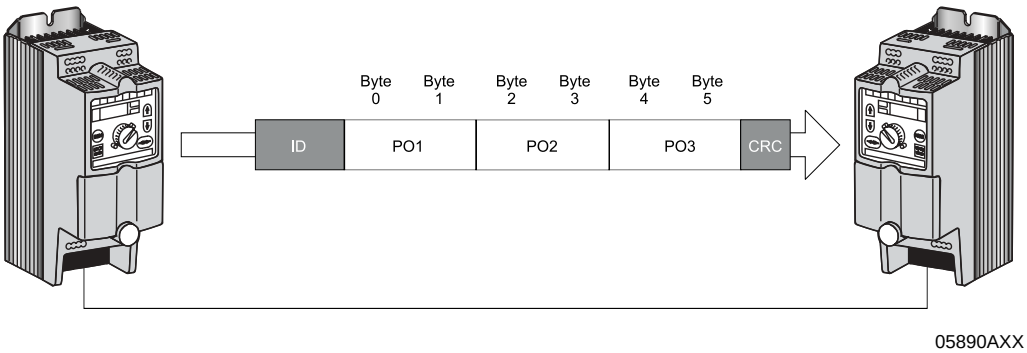

Figure 5: Group process data telegram

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Parameter telegrams

Parameter telegrams are made up of a parameter request telegram and a parameter response telegram.

The master sends the parameter request telegram to read or write a parameter value. It has the following components:

- Management byte
- Index high byte
- Index low byte
- Four data bytes

The management byte indicates the service that is to be performed. The index indicates the parameter for which the service will be performed. The four data bytes contain the numerical value to be read or written.

The resulting CAN telegram always includes 8 byte user data.

The slave sends the parameter response telegram in response to the parameter request telegram sent by the master. The request and response telegrams have the same structure.

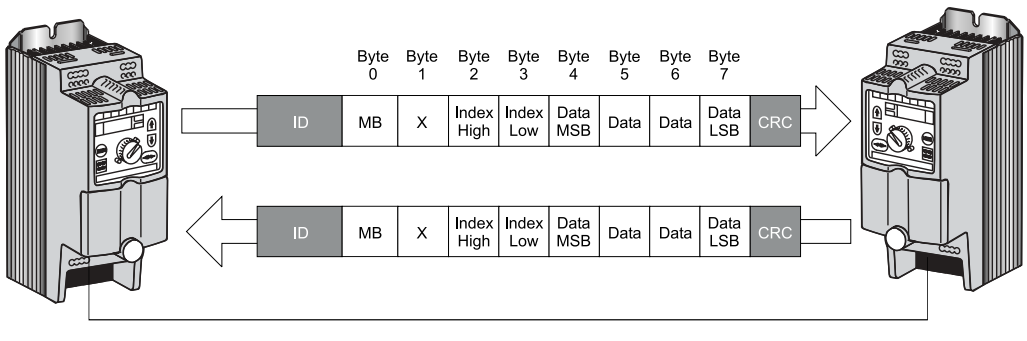

Figure 6: Parameter telegrams

MB = Management byte
X = Reserved

Group parameter telegram

The master sends the group parameter telegram to one or more slaves with the same SBus group address. Its structure is the same as the parameter request telegram. You can only write parameters of the slave units with this telegram. The slaves do not respond to the telegram.

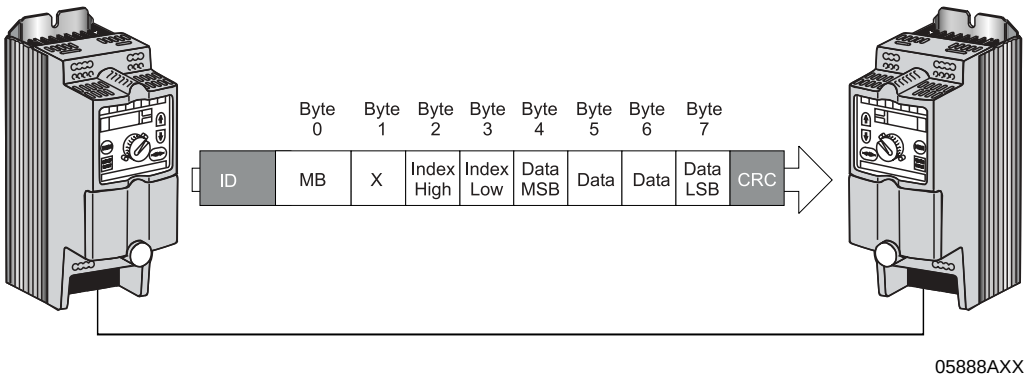

Figure 7: Group parameter telegram

MB = Management byte
X = Reserved

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Parameter settings

The following parameters have to be set on the MOVITRAC® 07 for communication via the SBus:

Par.	Name	Setting	Meaning
100	Setpoint source	SBus	The inverter gets its setpoint from the SBus.
101	Control signal source	SBus	The inverter gets its control commands from the SBus.
813	SBus address	0...63	Setting of the SBus address used for the exchange of parameter and process data.
814	SBus group address	0...63	Setting of the SBus group address for the receipt of group parameter data and group process data.
815	SBus timeout delay	0...650 s	Set the monitoring time for data transmission via the system bus with P815. MOVITRAC® 07 reacts with the error response 'rapid stop/fault' if there is no data traffic via the system bus for the time period set in P815. No monitoring of data transmission via the system bus takes place when P815 is set to the value 0.
816	SBus baud rate	125/250/500/1000 kbaud	The transmission speed of the SBus is set.
870 **871** **872**	PO1 setpoint description PO2 setpoint description PO3 setpoint description	Factory setting: CTRL. WORD 1 SPEED NO FUNCTION	The content of the process output data words PO1/PO2/PO3 is defined. This step is necessary so that the MOVITRAC® 07 can allocate the appropriate setpoints.
873 **874** **875** **876**	PI1 actual value description PI2 actual value description PI3 actual value description PO data enable	Factory setting: STATUS WORD 1 SPEED NO FUNCTION ON	The content of the process input data words PI1/PI2/PI3 is defined. This step is necessary so that the MOVITRAC® 07 can allocate the appropriate actual values. The process data must be enabled for the unit to accept the setpoints.

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4.2 Setting parameters via the SBus

The MOVITRAC® 07 inverter supports the MOVILINK® parameter channel with the SBus.

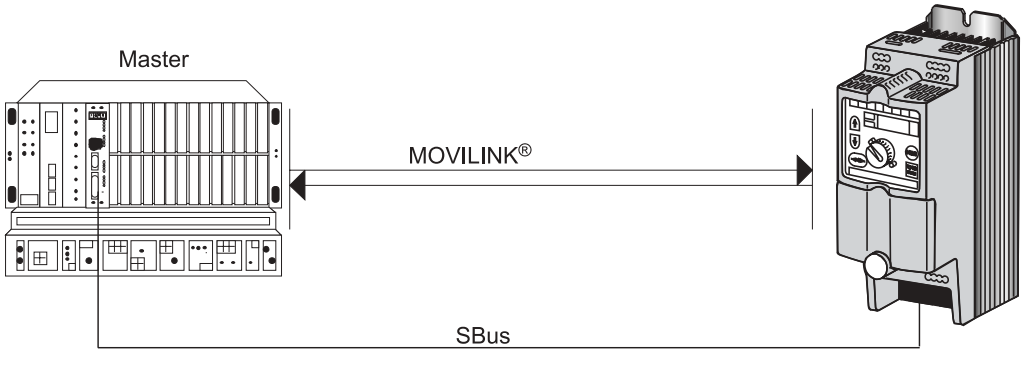

Figure 8: Services available via the SBus

Services

The inverter parameters are read and written via the SBus with the MOVILINK® parameter channel services of the application layer (layer 7 of the ISO/OSI model for communication).

Structure of the parameter telegram

Parameter setting of field devices via fieldbus systems requires functions and services such as READ and WRITE for reading and writing of parameters. The parameter telegram in the MOVILINK® profile serves such a purpose. The parameter data can be read and written via parameter telegrams.

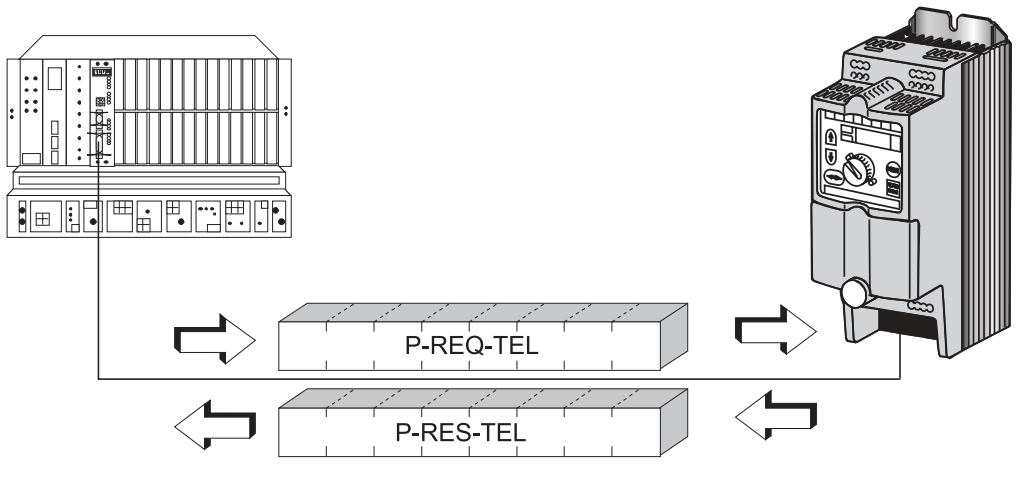

Figure 9: Parameter telegram for SBus

P-REQ-TEL = Parameter-Request-Telegram
P-REQ-TEL = Parameter-Response-Telegram

The following table shows the structure of the parameter telegram. In principle, it is made up of a management byte, an index word and four data bytes.

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Manage-ment	Reserved	Index high	Index low	Data MSB	Data	Data	Data LSB
		Parameter index		4 byte data			

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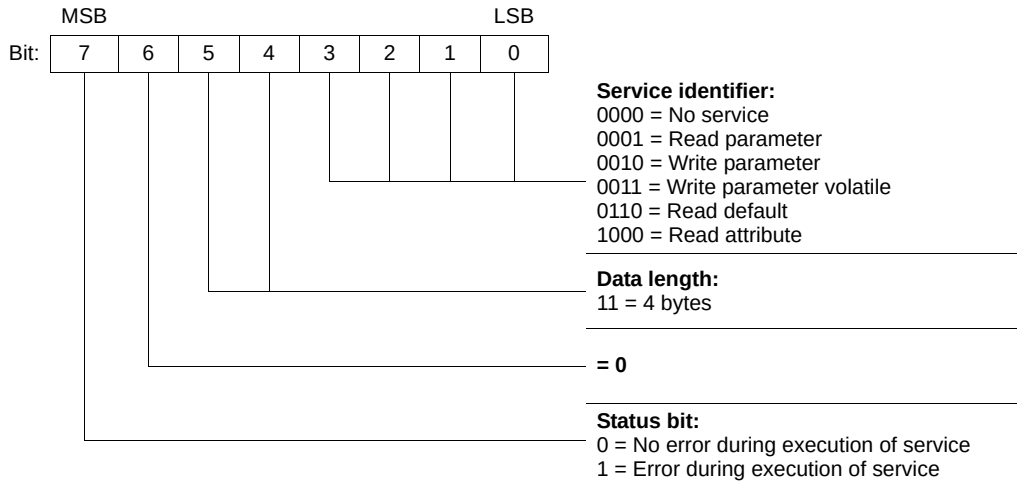
Byte 0: Management of the parameter telegram

The entire parameter setting sequence is coordinated with byte 0: "Management". This byte provides important service parameters such as service identifier, data length, version and status of the service performed. The following table shows that bits 0 ... 3 include the service identifier and define the service to be performed. Bit 4 and bit 5 specify the data length in bytes for the WRITE service. This setting should be 4 bytes for all SEW inverters.

- Bit 6 = 0: Asynchronous response (must be set to zero)

Status bit 7 indicates whether it was possible to carry out the service properly or if there were errors.

Byte 0: Management



Byte 1

Byte 1 should be considered reserved and must be set to 0x00.

Bytes 2 and 3: Index addressing

Byte 2: Index high and byte 3: Index low determines the parameter read or written via the fieldbus system. The parameters of an inverter are addressed with a uniform index regardless of the connected fieldbus system.

Byte 4 ... 7: Data range

The data are located in byte 4 to byte 7 of the parameter telegram. This means up to 4 bytes of data can be transmitted per service. The data are always entered with right-justification so that byte 7 contains the least significant data byte (Data LSB) while byte 4 is the most significant data byte (Data MSB).

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Management	Reserved	Index high	Index low	Data MSB	Data	Data	Data LSB
				High byte 1	Low byte 1	High byte 2	Low byte 2
				High word		Low word	
				Double word			

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Successful execution of service

The successful execution of a service is indicated by a status bit not set in the management byte. Byte 4 ... 7 of the parameter response telegram contain the data corresponding to the service.

Incorrect execution of a service

An incorrect execution of a service is indicated by setting the status bit in the management byte. If the status bit indicates an error, the error code is entered in structured form in the data range (byte 4 ...7) of the parameter telegram.

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Manage-ment	Reserved	Index high	Index low	**Error class**	**Error code**	**Add. code high**	**Add. code low**

↓

Status bit = 1: Incorrect execution of a service

Return codes for parameter setting

The return codes sent to the parameter-setting master in case of an incorrect execution of a service include detailed information concerning the cause of the error. These return codes are usually structured according to DIN 19245 T2. The system distinguishes between the following elements:

- Error class
- Error code
- Additional code

The operating instructions and the system manual include a description of the errors.

Special cases

- **Errors in parameter settings**

  An incorrect code was entered in the management byte during execution of a read or write service via SBus.

  In this case, the MOVITRAC® 07 firmware prompts the following return code:

	Code (dec)	Meaning
Error class:	5	Service
Error code:	5	Illegal value
Add. code high:	0	–
Add. code low:	0	–

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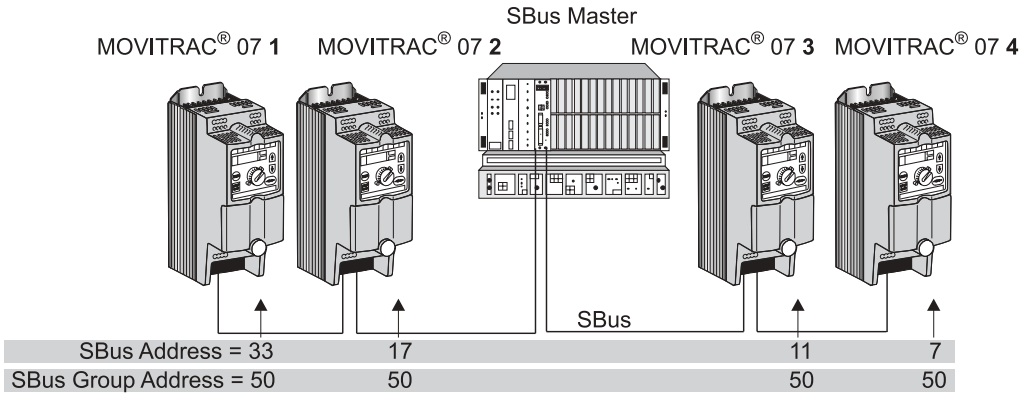
4.3 Project planning example for SBus

Specifications

The following settings have to be made:

- Four inverters
- Process data length 3
- Baud rate 500 kbit/s



05895AXX

Figure 10: Sample for project planning

Settings

Use parameter P816 to set the required SBus baud rate on all inverters. All inverters must be set to the same baud rate. The factory setting for the baud rate is 500 kbaud. The fixed setting for the number of process data on the SBus is "3 process data words."

Then use parameter P813 to set the SBus address on each inverter. In this example, the SBus address is assigned to the inverters according to the following table:

Inverters	SBus address	SBus group address
1	33_{dec}	50_{dec}
2	17_{dec}	50_{dec}
3	11_{dec}	50_{dec}
4	7_{dec}	50_{dec}

You will realize that there is no prescribed sequence for setting of the SBus address. Do not assign the addresses several times; two drive inverters must not share the same SBus address.

In addition, the terminating resistor must also be switched on at the ends of the cable. Do this by setting the S12 DIP switch on inverters 1 and 4 to ON. The terminating resistors must be switched off on all other stations, such as inverters 2 and 3 and the SBus master control.

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IDs on the SBus

In this combination, the IDs listed below are occupied on the SBus:

Drive inverters	SBus address	ID [dec]	Telegram type
1	33_{dec}	267	Process output data telegram (PO)
		268	Process input data telegram (PI)
		779	Parameter request telegram
		780	Parameter response telegram
2	17_{dec}	139	Process output data telegram (PO)
		140	Process input data telegram (PI)
		651	Parameter request telegram
		652	Parameter response telegram
3	11_{dec}	91	Process output data telegram (PO)
		92	Process input data telegram (PI)
		603	Parameter request telegram
		604	Parameter response telegram
4	7_{dec}	59	Process output data telegram (PO)
		60	Process input data telegram (PI)
		571	Parameter request telegram
		572	Parameter response telegram
1 / 2 / 3 / 4	SBus group address 50_{dec}	406	Group process data telegram (GPO)
		918	Group parameter telegram

The IDs are calculated on the basis of the set SBus address (P813) and the offset that describes the corresponding telegram.

Process data length = 3 means that the inverter receives exactly three process output data words and sends three process input data words to the master control.

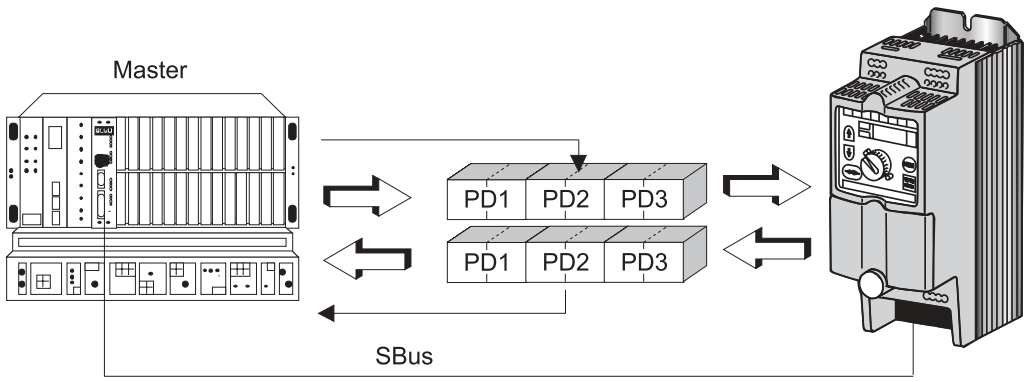

Figure 11: Programming a process data word

The contents of the process data words is defined via the parameter process output data description 1 ... 3 and process input data description 1 ... 3.

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5 System Bus Communication Master

5.1 MOVITRAC® 07 as MOVILINK® master

MOVILINK® commands can be sent via IPOS$^{plus®}$ to send parameter or process data telegrams to other stations. The command for execution of a parameter and/or process data exchange is MOVLNK.

The Movilink (...) command is not suitable for multiple master configurations. There may only be one master in the whole network during the entire execution period of a MOVLNK command!

Use the IPOS$^{plus®}$ SCOM command if you want to use a multimaster-capable protocol.

The Movilink (...) command has the variable H as its argument. This variable refers to a command structure. All information required for communication must be entered into this command structure.

The command structure contains several variables that select the interface defining the type of transmission and data. The command structure is explained in the following table:

MOVLNK MI _Movilink (...)

Variable no.	Name	Values	Meaning
H	MI.BusType	0 = reserved 1 = reserved 2 = RS-485 3 = reserved 4 = reserved 5 = SBus (MOVILINK) 6 = CANopen	This process selects the interface to be used for transmitting a MOVILINK® command.
H + 1	MI.Address	0 ... 63 (SBus) **100 ... 163 (SBus)** 1 ... 127 (CANopen)	– The SBus address is required for standard services. – Add **100** to the SBus group address to determine the group address.
H + 2	MI.Format	0 = Param + 1PD 1 = 1PD 2 = Param + 2PD 3 = 2PD 4 = Param + 3PD 5 = 3PD 6 = Param (without PD)	Description of the telegram structure. for example Frametype = 4: One MOVLNK command transmits parameters and three process data.
H + 3	MI.Service	1 = Read 2 = Write[1] 3 = Write without saving	– Reading a parameter via parameter telegram. – Writing with saving to non-volatile memory. – Write without saving.
H + 4	MI.Index	Index number of a parameter	Index number of the parameter to be modified or read.
H + 5	MI.DPointer	Variable number	Number of the variable H' where the read data are stored or from where the data to be written are obtained.
H + 6	MI.Result	Error code or 0	Contains the error code after execution of the service or zero if no error has occurred.

1 The memory may be used up after 100 000 write processes if you write cyclically in the non-volatile memory. That means the inverter will stop functioning after five years if you write something every 20 minutes. Or after one month if you write two values per second.

You may not write cyclically in the non-volative memory!

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The DPointer points to a data structure that is explained in the following table:

MLDATA Mld

Variable no.	Name[1]	Meaning
H'	Mld.WritePar	Contains the data for a parameter write service.
H' + 1	Mld.ReadPar	Contains the data that are read by a parameter service.
H' + 2	Mld.PO1	1. Process output data word sent from the master unit to the slave unit.
H' + 3	Mld.PO2	2. Process output data word sent from the master unit to the slave unit.
H' + 4	Mld.PO3	3. Process output data word sent from the master unit to the slave unit.
H' + 5	Mld.PI1	1. Process input data word sent from the slave unit to the master unit.
H' + 6	Mld.PI2	2. Process input data word sent from the slave unit to the master unit.
H' + 7	Mld.PI3	3. Process input data word sent from the slave unit to the master unit

1 The name is not displayed.

IPOS$^{plus®}$ sample program

The command structure is initialized first. The following table shows a sample command structure:

MOVLNK Ml

Name	Value	Meaning
Ml.BusType	5	Using the SBus with MOVILINK® profile
Ml.Address	1	Slave address
Ml.Format	4	Parameter data and three process data
Ml.Service	1	Read parameter data
Ml.Index	8318	Index of the parameter: Speed
Ml.DPointer	H20	Data structure starting with variable H20

The DPointer points to the data structure that may be initialized with the following values:

MOVLNK Mld

Name[1]	Value	Meaning
Mld.WritePar	0	Can contain any value because a read service is performed.
Mld.ReadPar	1000000	This value is sent in the parameter telegram from the slave and represents the speed for parameter 8318 (notation with three decimal places!)
Mld.PO1	6	The process output data word 1 is programmed to control word 1 on the slave. The slave is enabled by the value 6.
Mld.PO2	5000	The process output data word 2 is programmed to speed on the slave. The value 5000 specifies a speed of 1000 min^{-1} for the slave (5000/5 min^{-1}).
Mld.PO3	15000	The process output data word 3 is programmed to max. speed on the slave. The value 15000 specifies a maximum speed of 3000 min^{-1} for the slave (15000/5 min^{-1}).
Mld.PI1	7	The process input data word 1 is programmed to status word 1 on the slave. The slave sends its status with the value 7.
Mld.PI2	5011	The process input data word 2 is programmed to speed on the slave. The slave sends its actual speed with the value 5011. It is 1002.2 min^{-1} (5011/5 min^{-1}).
Mld.PI3	0	The process input data word 3 is programmed to "No function" on the slave. The value 0 is sent.

1 The name is not displayed.

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IPOS$^{plus®}$ program sequence

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Figure 12: Master data exchange via MOVILINK®

The parameter response and process input data are updated after execution of the Movilink (...) command, provided there was no error during the transmission. If an error has occurred, it is signaled in the return code by a value other than zero.

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5.2 Data exchange via profile-independent variable telegrams

General information

Unit parameters and process data can be exchanged between units via MOVILINK®. Both the transfer frame and the identifiers used are defined on the CAN bus.

Variable telegrams were introduced to create an open CAN bus interface. You have the free choice of the identifier with which to send the telegrams with the variable telegrams; the 8 bytes of data on the CAN bus are used for the content of two IPOS$^{plus®}$variables.

This setup provides an interface for direct access to layer 2 of the CAN bus. The result is the maximum processing speed for transmission of variables via the CAN bus.

The CAN bus can handle several masters, which means each station can send a message independently. All bus stations always listen actively to see which telegrams are being sent on the bus. Each station filters out the telegrams that are important for itself and makes the data available to the application.

These characteristics make it possible to work with an object-oriented approach. The stations send objects that are received by those stations that want to process them.

Each station can send and receive objects. It is important to note that each transmit object may only be sent by one station to avoid arbitration errors on the CAN bus.

CAN bus identifiers are reserved for the SBus MOVILINK® telegrams. The following rules apply:

1. A particular identifier may only be sent by one station. This means those identifiers used for sending messages in the MOVILINK® protocol are no longer available for the exchange of variables.
2. An SBus identifier may only be used once within a unit. This means those identifiers used for the SBus MOVILINK® protocol in a unit are no longer available for the transmission of variables.

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Example for assignment of the CAN identifiers

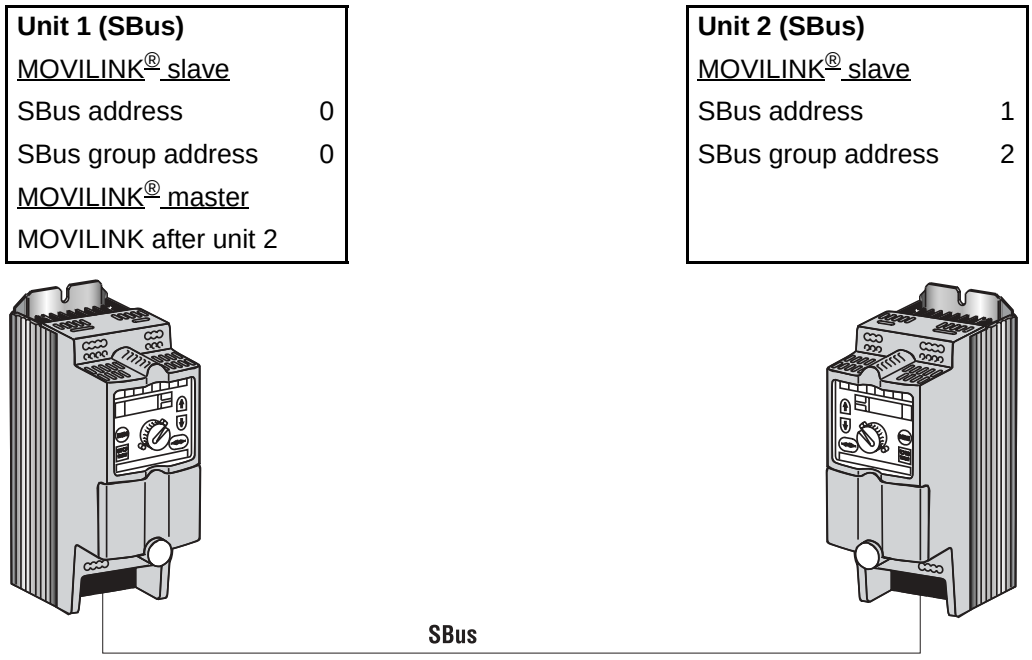

Figure 13: Example for assignment of the CAN identifiers

The following table shows the assignment of the identifiers:

Master/slave	Type	Unit 1	ID	Unit 2	ID
Unit 1 is a slave	**SBus address**	0		–	
	Master/slave	Slave		–	
	Parameter request ID	Receive	515	–	
	Parameter response ID	Transmit	516	–	
	PO async.	Receive	3	–	
	PI	Transmit	4	–	
	SBus group address	0		–	
	Master/slave	Slave		–	
	Parameter request ID	Receive	518	–	
	PO	Receive	6	–	
Unit 1 is a master / Unit 2 is a slave	**SBus address**	1		1	
	Master/slave	Master		Slave	
	Parameter request ID	Transmit	523	Receive	523
	Parameter response ID	Receive	524	Transmit	524
	PO async.	Transmit	11	Receive	11
	PI	Receive	12	Transmit	12
	SBus group address	2		2	
	Master/slave	Master		Slave	
	Parameter request ID	Transmit	534	Receive	534
	PO	Transmit	22	Receive	22

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The following relationship results from the previous table:

1. The identifiers shown on a gray background in the table (transmit identifiers) are no longer allowed to be used for variable transmit objects within this bus line.
2. The identifiers used within a unit (→ unit column) may no longer be used for the variable objects (transmit and receive).

The following variable objects are not to be used in the example (unit specific!):

Telegram type	Unit 1		Unit 2	
	Transmit	Receive	Transmit	Receive
Process data	3, 4; 11, 12	3, 4; 11, 12	4; 11, 12	11, 12
Group process data	515, 516; 523, 524	515, 516; 523, 524	516; 523, 524	523, 524
Parameter	6; 22	6; 22	22	22
Group parameter	518; 534	518; 534	534	534

Two different IPOS$^{plus®}$ commands are provided for variable transmission:

1. _SBusCommDef (...): Transmission of variable telegrams
2. _SBusCommOn ( ): Initialization and start of cyclical variable telegram transmissions

The following services are available for the SCOM command:

1. SCD_TRCYCL: Cyclical sending of variable telegrams
2. SCD_TRACYCL: Acyclical sending of variable telegrams
3. SCD_REC: Receiving variable telegrams

These commands are described below.

Cyclical sending of variable telegrams

Command: _SBusComDef (SCD_TRCYCL, TrCycle)

(detailed description IPOS$^{plus®}$ manual →)

This command sets up a cyclical variable service which sends a variable telegram with a set identifier at cyclical intervals.

Cyclical data transmission is started using the *_SBusCommOn ( )* command and interrupted with a program stop.

The number of transmit objects that can be set up depends on the cycle time of the transmit objects:

Cycle time	Maximum number of transmit objects
10 ... 65530 ms	10

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SCOM TRANSMIT CYCLIC contains a variable pointer as its second argument. The specified variable points to a command structure.

SCTRCYCL TrCycl

Variable no.	Name	Value	Meaning
H	ObjectNo	0 ... 2047	Describes the object number (CAN bus identifier).
H +1	Cycletime	10 ... 65530	Cycle time: 10 ... 65530 ms Step 10ms
H + 2	Offset	0 ... 65530	Time offset: 0 ... 65530ms Step 10ms
H + 3	Len	0h ... 8h 100h ... 108h	Number of data bytes and data format. The length is specified in bits 0 ... 3. The data format is specified in bit 8.
H + 4	DPointer	e.g. 20	The data structure starts with variable H20.
H + 5	Result	≥ 0 –1 –2 –3	Return code of initialization: • Free bus capacity in % • Incorrect cycle time • Too many objects set up • Bus overload

The DPointer refers to the data structure, in this case variable H20.

Variable no.	Name	Meaning
H'	long lTrDataLow	Contains the data of the 1st variable
H' + 1	long lTrDataHigh	Contains the data of the 2nd variable

The second variable is only used if a length greater than 4 bytes is set.

Receiving variable telegrams

Command: _SBusComDef (SCD_REC, Rec)

(detailed description IPOS$^{plus®}$ manual →)

This command sets up a variable read service that receives a variable telegram with a set identifier.

Initialization of the objects is started using the *_SBusCommOn ( )* command and interrupted with a program stop.

The number of receive objects that can be set up is restricted to 32 objects.

SCOM RECEIVE contains a variable pointer as its second argument. The specified variable points to a command structure.

SCREC Rec

Variable no.	Name	Value	Meaning
H	ObjectNo	0 ... 2047	Describes the object number (CAN bus identifier).
H + 1	Len	0h ... 8h 100h ... 108h	Number of data bytes and data format. The length is specified in bits 0 ... 3. The data format is specified in bit 8.
H + 2	DPointer	e.g. 20	Data structure starts with variable H20.

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The DPointer refers to the data structure, in this case variable H20.

Variable no.	Name	Meaning
H'	long lRecDataLow	Contains the data of the 1st variable
H' + 1	long lRecDataHigh	Contains the data of the 2nd variable

The second variable is only used if a length greater than 4 bytes is set.

Sending acyclical variable telegrams

Command: _SBusComDef (SCD_TRACYCL, TrAcycl)

(detailed description IPOS$^{plus®}$ manual →)

This command sets up an acyclical variable write service that sends a variable telegram with a set identifier within an IPOS$^{plus®}$ program cycle.

Initialization of the objects and sending of the object is undertaken immediately after execution of the *SCD_TRACYCL* command.

SCD_TRACYCL contains a variable pointer as its second argument. The specified variable points to a command structure.

SCTRACYCL TrAcycl

Variable no.	Name	Value	Meaning
H10	ObjectNo.	0 ... 2047	Describes the object number (CAN bus identifier).
H11	Len	0h ... 8h 100h ... 108h	Number of data bytes and data format. The length is specified in bits 0 ... 3. The data format is specified in bit 8.
H12	DPointer	e.g. 20	Data structure starts with variable H20.
H13	Return code	0 1 2 3	• Ready • Transmission in progress • Transmission successful • Transmission problem

The DPointer refers to the data structure, in this case variable H20.

Variable no.	Name	Meaning
H20	long lTrAcyclDataLow	Contains the data of the 1st variable.
H21	long lTrAcyclDataHigh	Contains the data of the 2nd variable.

The 2nd variable is only used if a length greater than 4 bytes is set.

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Transmission formats and examples

MOTOROLA format

Telegram 1:

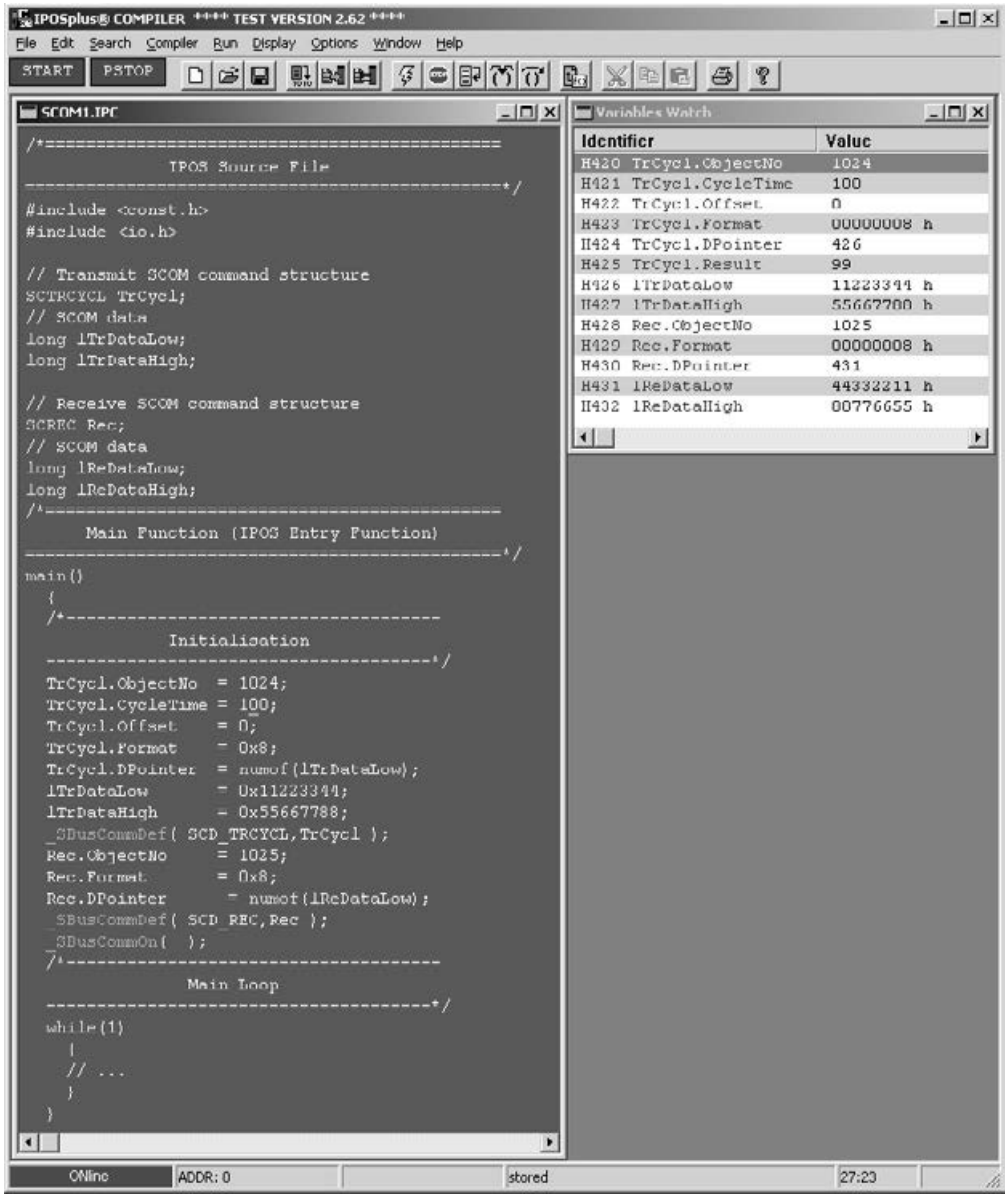

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Figure 14: Example of SCOM with MOTOROLA format, telegram 1

Telegram 2:

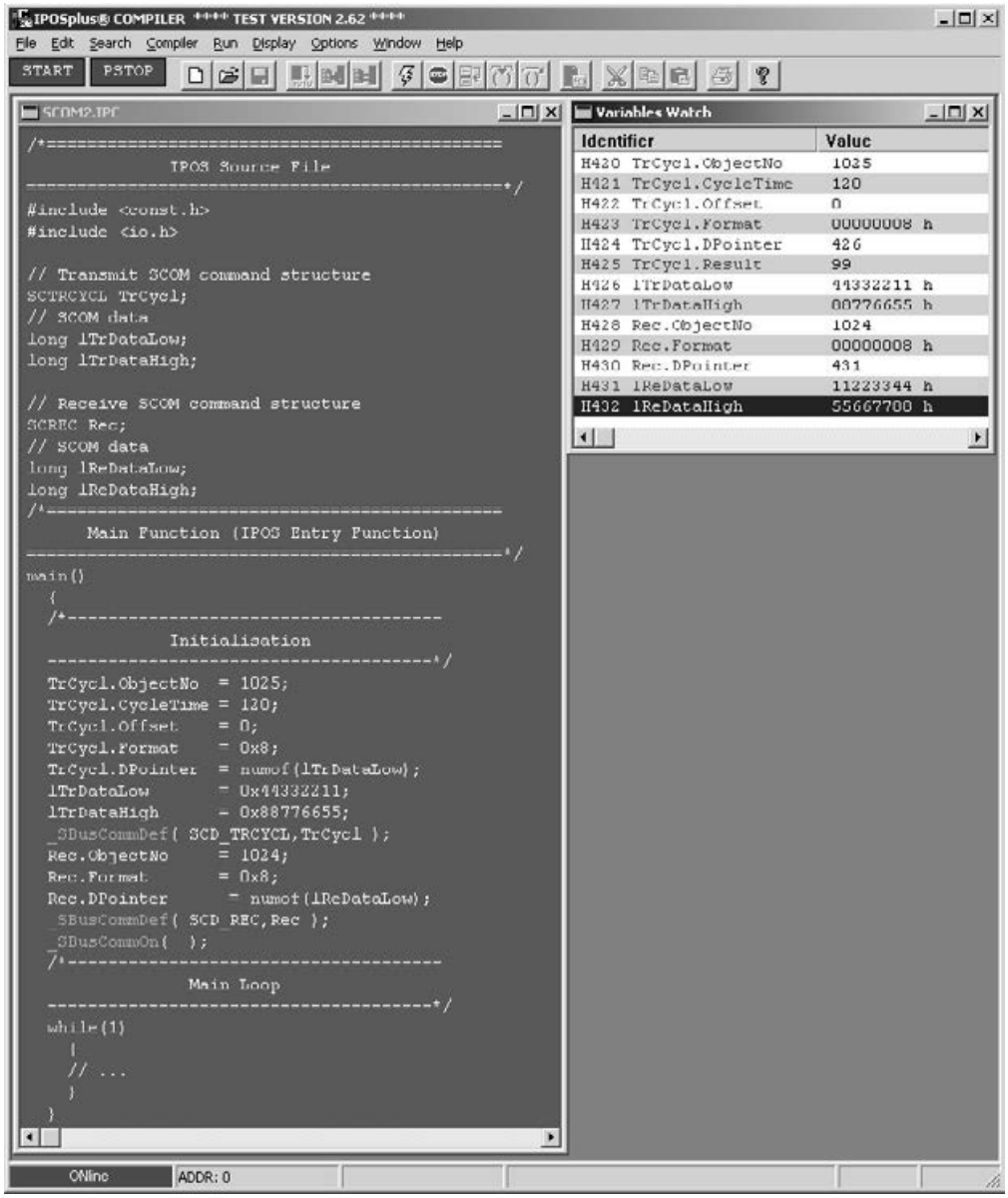

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Figure 15: Example of SCOM with MOTOROLA format, telegram 2

In the example, a variable telegram (= telegram 1) with a length of 8 bytes (i.e. two variables) and object number 1024 (CAN-ID) is sent from unit 1 every 100 ms and received by unit 2.

A second variable telegram (= telegram 2) with a length of 8 bytes (i.e. two variables) and object number 1025 (CAN-ID) is sent from unit 2 every 50 ms with a time offset of 120 ms and received by unit 1.

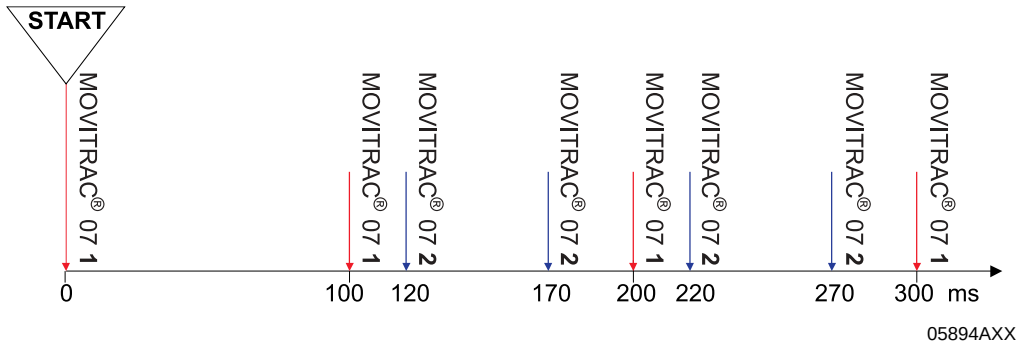

Figure 16: Time relationships with the SCOM command

The MOTOROLA format is characterized by the fact that the high byte is transmitted first and the low byte is transmitted last.

IPOS variables
...
20 11223344h
21 55667788h

CAN bus telegram

Byte	Identifier	0	1	2	3	4	5	6	7	CRC
Significance		MSB			LSB	MSB			LSB	
Value		55h	66h	77h	88h	11h	22h	33h	44h	
Variable		H21 = DPointer + 1				H20 = DPointer				

Intel format

For the Intel format, change the following lines in the program(Figure 14 / Figure 15) for the format assignment as follows:

TrCycl.Format = 0x108

Rec.Format = 0x108

The data will be sent and received in Intel format.

The INTEL format is characterized by the fact that the low byte is transmitted first and the high byte is transmitted last.

IPOS variables
...
20 11223344h
21 55667788h

CAN bus telegram

Byte	Identifier	0	1	2	3	4	5	6	7	CRC
Significance		LSB			MSB	LSB			MSB	
Value		44h	33h	22h	11h	88h	77h	66h	55h	
Variable		H21 = DPointer				H20 = DPointer + 1				

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5.3 Programming of the data exchange in LOGODrive

Data exchange can be programmed in the Compiler or by placing the corresponding function blocks in the LOGODrive interface.

The notes concerning project planning and parameter setting of the communication for programming with the Compiler also apply to programming in LOGODrive.

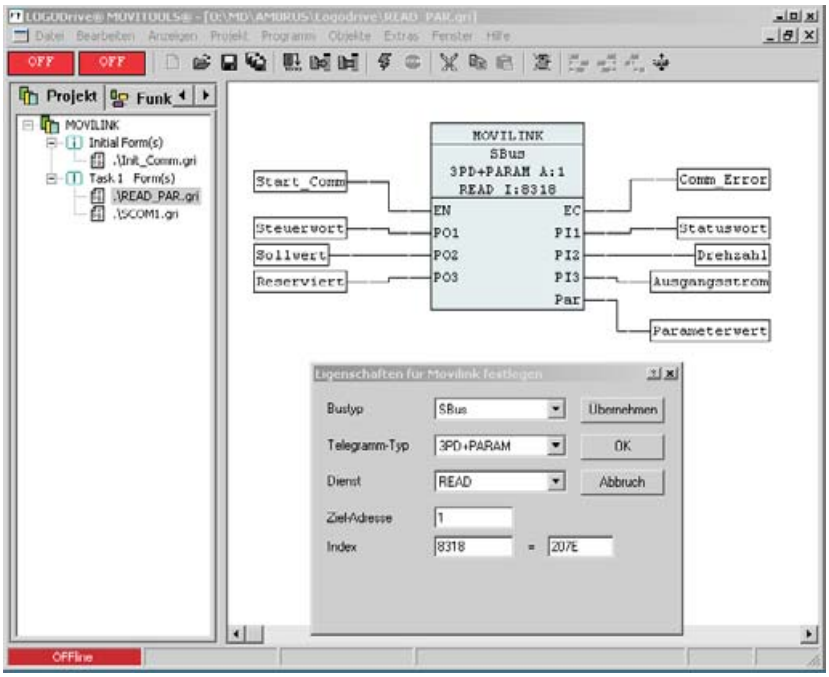

Figure 17: MOVILINK characteristics

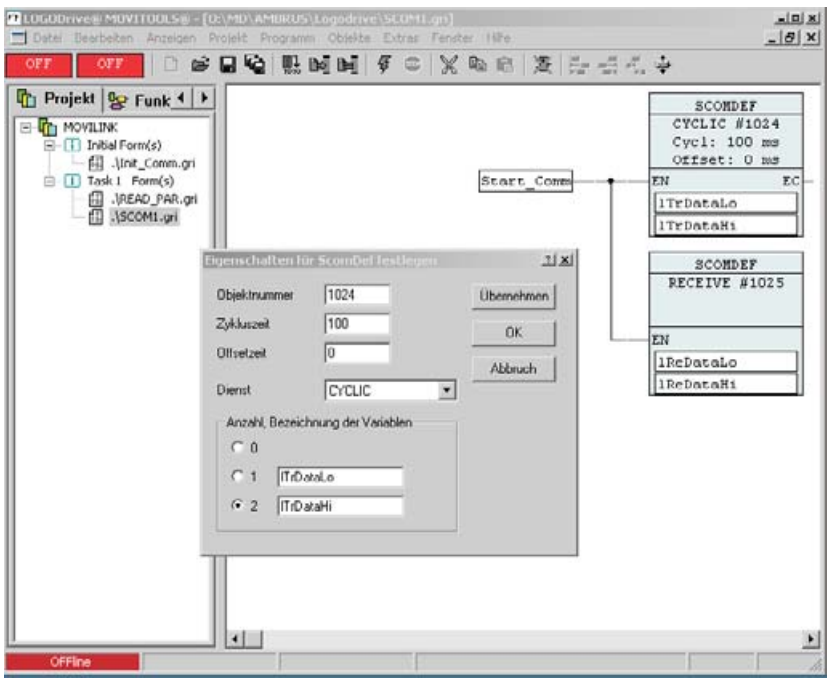

Figure 18: ScomDef characteristics

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6 Unit Profile

6.1 Scaling of process data

The process data are always transmitted in hexadecimal form to make for simple calculation in the ongoing system process. Parameters with identical units of measurement receive the same scaling so that the higher-level automation device can directly compare the set and actual values in the application program. The system distinguishes between the following process data:

- Speed values in revolutions per minute [1/min].
- Relative speed values in % of the maximum speed set in parameters P302/P312.
- Current values in % of the rated unit current.
- Ramp times in ms for a change of Δf = 50 Hz.

The different versions of the control or status word are coded as bit field and will be discussed as ofpage 33 .

Process data	Type	Resolution	Reference	Area
Speed setpoint Actual speed value Max. speed	Integer 16	1 digit = 0.2 min^{-1}		–6553.6 ... 0 ... +6553.4 min^{-1} 8000_{hex} ... 0 ... $7FFF_{hex}$
Relative speed setpoint [%] Relative actual speed value [%]	Integer 16	1 digit = 0.0061 % (4000_{hex} = 100 %)	Maximum inverter speed (P302/P312)	–200 % ... 0 ... +200 % – 0.0061 % 8000_{hex} ... 0 ... $7FFF_{hex}$
Relative PI controller setpoint [%] Relative PI actual controller value [%]				
Actual value output current Actual value active current	Integer 16	1 digit = 0.1 % I_N	Rated inverter current	–3276.8 % ... 0 ... +3276.7 % 8000_{hex} ... 0 ... $7FFF_{hex}$
Process ramp	Unsigned 16	1 digit = 1 ms	delta-f = 50 Hz	0 ms ... 65535 ms 0000_{hex} ... $FFFF_{hex}$

Positive speed values correspond to a CW rotation with proper connection of the motor.

Examples

Process data	Value	Scaling	Transmitted process date
Speed	CW 400 min^{-1}	(400/0.2) = 200_{dez} = $07D0_{hex}$	2000_{dez} = $07D0_{hex}$
	CCW 750 min^{-1}	(–750/0.2) = 2750_{dez} = $F15A_{hex}$	$–3750_{dez}$ = $F15A_{hex}$
Relative speed	CW 25 % n_{max}	25 × (16384/100) = 4096_{dez} = 1000_{hex}	4096_{dez} = 1000_{hex}
	CCW 75 % n_{max}	–75 × (16384/100) = 12288_{dez} = $D000_{hex}$	$–12288_{dez}$ = $D000_{hex}$
Current	45 % I_N	(45/0.1) = 450_{dez} = $01C2_{hex}$	450_{dez} = $01C2_{hex}$
	115.5 % I_N	(115.5/0.1) = 1155_{dez} = 0483_{hex}	1155_{dez} = 0483_{hex}
Ramp	300 ms	300 ms → 300_{dez} = $012C_{hex}$	300_{dez} = $012C_{hex}$
	1.4 s	1.4 s = 1400 ms → 1400_{dez} = 0578_{hex}	1400_{dez} = 0578_{hex}

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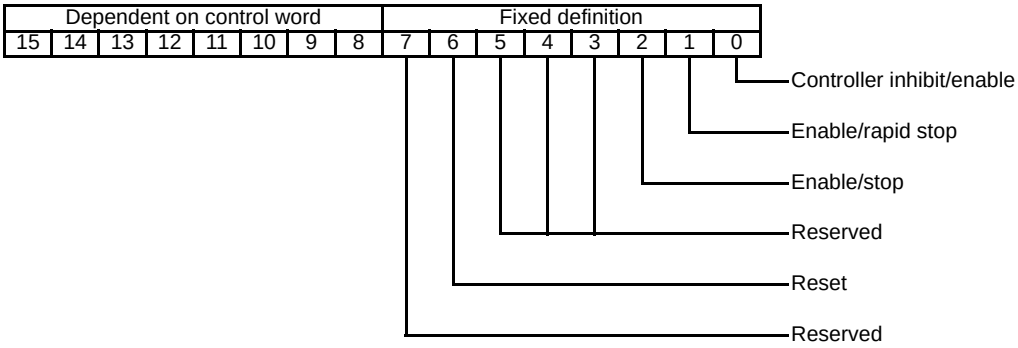
6.2 Definition of the control word

The control word is 16 bits wide. Each bit has been assigned an inverter function. The low byte consists of eight fixed function bites that are always valid. The assignment of the more significant eight control bits varies for the different control words.

Functions that are generally not supported by the inverter cannot be activated by the control word. The operator is to consider the individual control word bits as reserved and set them to logical 0!

Basic control block

The less-significant part of the control word contains eight fixed function bits for the most important drive functions. The following table shows the assignment of the basic control block:



The following table shows the functionality of the individual control bits.

Bit	Functionality	Assignment
0	Controller inhibit	0 = Enable 1 = Inhibit controller, activate brake
1	Enable/rapid stop	0 = Rapid stop 1 = Enable
2	Enable/stop	0 = Stop at integrator ramp or process ramp 1 = Enable
6	Reset	0 = not active 0 → 1 = reset pending fault
	Reserved	Set reserved bits to zero!

6.3 Connection of control commands

The control commands have the following significance:

- CONTROL.INHIBIT
- RAPID STOP
- STOP

They are activated via:

- Binary inputs
- Control word processing bus, if P101 control source is set to RS-485 or SBus.
- IPOS$^{plus®}$ control word H484 (LOGODrive units only)

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As soon as one of the three processing blocks triggers a control command of higher priority (such as RAPID STOP or CONTRL.INHIBIT), it will become effective.

The binary inputs will generally remain active even if the inverter is controlled via the process data (P101 control source = RS-485 / SBus). Safety-related functions, such as CONTROLLER INHIBIT and NO ENABLE, will be equally processed by the terminal strip and the fieldbus. For control via fieldbus, the drive inverter must be enable via a terminal for CW or CCW rotation. The terminal CW or CCW does not determine the direction of rotation. The direction is determined by the sign of speed setpoint.

All other functions that can be activated via terminals and the control word or IPOS$^{plus®}$ control word will be processed with an OR function.

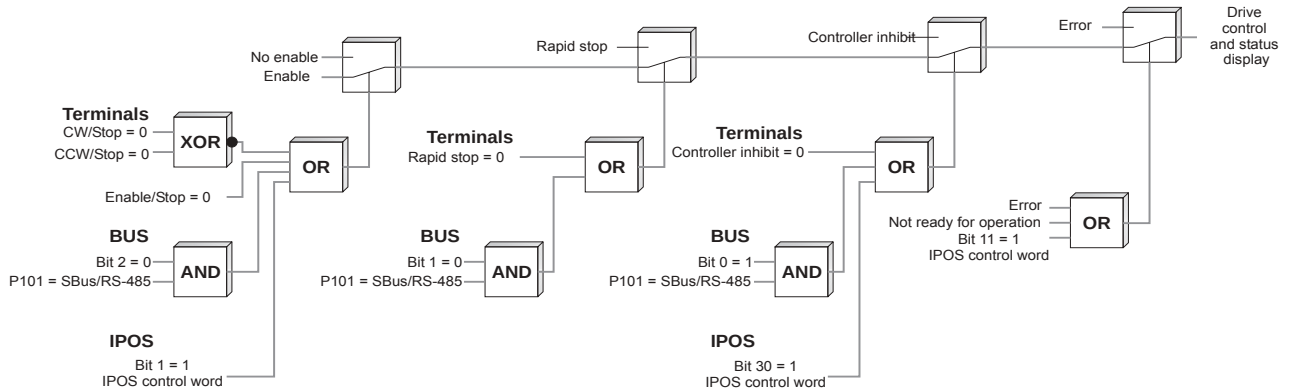

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Figure 19: Logic operation of control signals from input terminals and SBus

For safety reasons, the basic control block is defined so that the inverter with the control word setting 0000_{hex} will assume the safe state *No enable* because all commercially available fieldbus master systems will definitely reset the ouputs to 0000_{hex} in case of an error! In this case, the inverter will execute a rapid stop and then activate the mechanical brake.

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Control of the inverter with bit 0 - bit 2

If the inverter was enabled on the terminal side, it can be controlled with bit 0 - bit 2 of the basic control block.

Priority	Control command	Bit 2	Bit 1	Bit 0	Possible process date
High	Controller inhibit	X	X	1	e. g. 01_{hex}, 03_{hex}, 05_{hex}, 07_{hex}
	Rapid stop	X	0	0	e. g. 00_{hex}, 04_{hex}
	Stop	0	1	0	e. g. 02_{hex}
low	Enable	1	1	0	e. g. 06_{hex}

Bit 2: Enable/stop
Bit 1: Enable/rapid stop
Bit 0: Controller inhibit/enable

Control command Controller inhibit

You can block the power output stages of the inverter and set it to high impedance with the control command *Controller inhibit*. At the same time, the inverter activates the mechanical motor brake so that the drive will immediately come to a standstill through mechanical braking. Motors without mechanical brake will coast to standstill when using this control command.

You activate the control command *Controller inhibit* by setting *Bit 0: Controller inhibit/ enable* in the control word because all other bits are not important. This setting will assign the highest priority to this control bit in the control word.

Control command Rapid stop

The control command *Rapid stop* will have the inverter brake the motor at the rapid stop ramp set via parameters.

- P136 T13 Rapid stop ramp

The process ramp that may have been set via fieldbus does not affect the rapid stop!

Activation of the control command takes place by resetting *Bit 1: Enable/rapid stop*.

Control command Stop

The control command *Stop* will have the inverter brake the motor. If the process ramp is transmitted via the fieldbus system, this control command will use the currently indicated ramp value as brake ramp. If not, the inverter will use the parameter setting *"Ramp down"* for this control command.

The control command *Stop* is activated by resetting *Bit 2: Enable/stop*.

Control command Enable

You enable the inverter via the fieldbus system with the control command *Enable*. If the process ramp is transmitted via the fieldbus system, this control command will use the currently indicated ramp value as brake ramp. If not, the inverter will use the parameter setting *"Ramp up"* for this control command.

All three bits must be set to *Enable* (110_{bin}) for the control command *Enable*.

Reset after error

In case of an error, bit 6 of the control word will execute a reset via the process data channel. The reset can be activated with a 0/1 edge in the control word.

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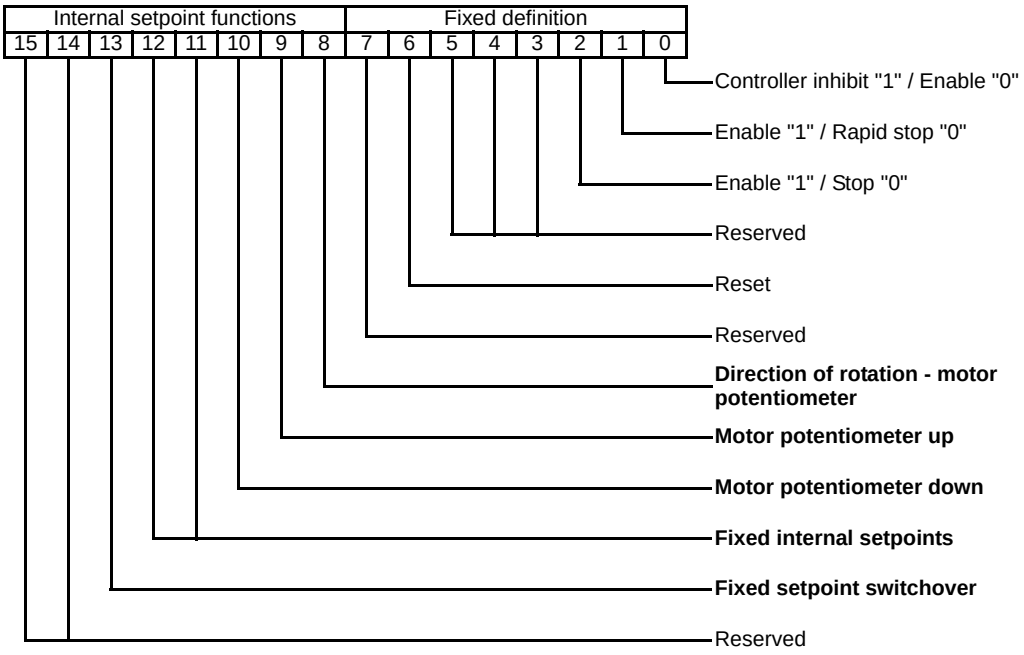
Control word 1

Control word 1 includes the most important drive functions of the basic control block as well as the function bits for setpoint functions that are generated in the MOVITRAC® 07 inverter in the byte with more significance.


Internal setpoint functions
Fixed definition
15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
Controller inhibit "1" / Enable "0"
Enable "1" / Rapid stop "0"
Enable "1" / Stop "0"
Reserved
Reset
Reserved
Direction of rotation - motor potentiometer
Motor potentiometer up
Motor potentiometer down
Fixed internal setpoints
Fixed setpoint switchover
Reserved

Control word 1 makes it possible to control the inverter with only one process output data word in the I/O or peripheral area of the higher-level automation device by using the internal setpoint functions.

The following table shows the assignment of the higher-level control block with the internal setpoint functions.

Bit	Functionality	Assignment
8	Direction of rotation for motor potentiometer	0 = CW direction of rotation 1 = CCW direction of rotation
9 10	Motor potentiometer high Motor potentiometer low	10 9 0 0 = no change 1 0 = down 0 1 = up 1 1 = no change
11 12	Selection of the fixed internal setpoints n11...n13 or n21...n23	12 11 0 0 = speed setpoint via process output data word 2 0 1 = internal setpoint n11 (n21) 1 0 = internal setpoint n12 (n22) 1 1 = internal setpoint n13 (n23)
13	Fixed setpoint switchover	0 = Fixed setpoints of the active parameter set selectable via bit 11/12 1 = Fixed setpoints of the other parameter set selectable via bit 11/12
14	Reserved	Set reserved bits to zero!
15	Reserved	Set reserved bits to zero!

These internal setpoint functions are activated by setting parameter P100 to fixed setpoint or motor potentiometer and setting the matching bits in control word 1. Any speed setpoint entered via an SBus process output data word will no longer be effective!

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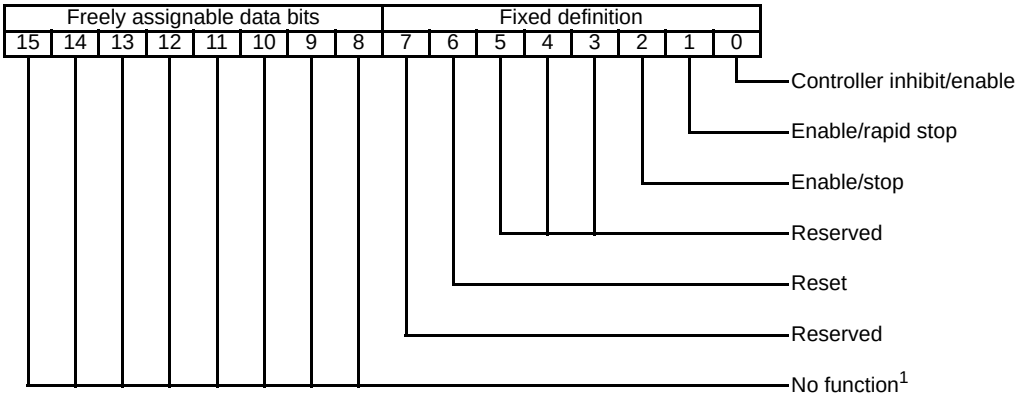
Motor potentiometer function via fieldbus

Control of the setpoint function motor potentiometer takes place via the fieldbus interface in the same way as the setting of standard input terminals. The process ramp that may be entered via an additional process output data word has no effect on the motor potentiometer function. Only the motor potentiometer integrators will be used.

- P150 T3 ramp up = down

Control word 2 (LOGODrive units only)

Control word 2 is available in LOGODrive units only; it contains function bits for the most important drive functions.



1 The freely assignable data bits can be read with the GETSYS PO-DATA command.

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6.4 Setpoint cascade

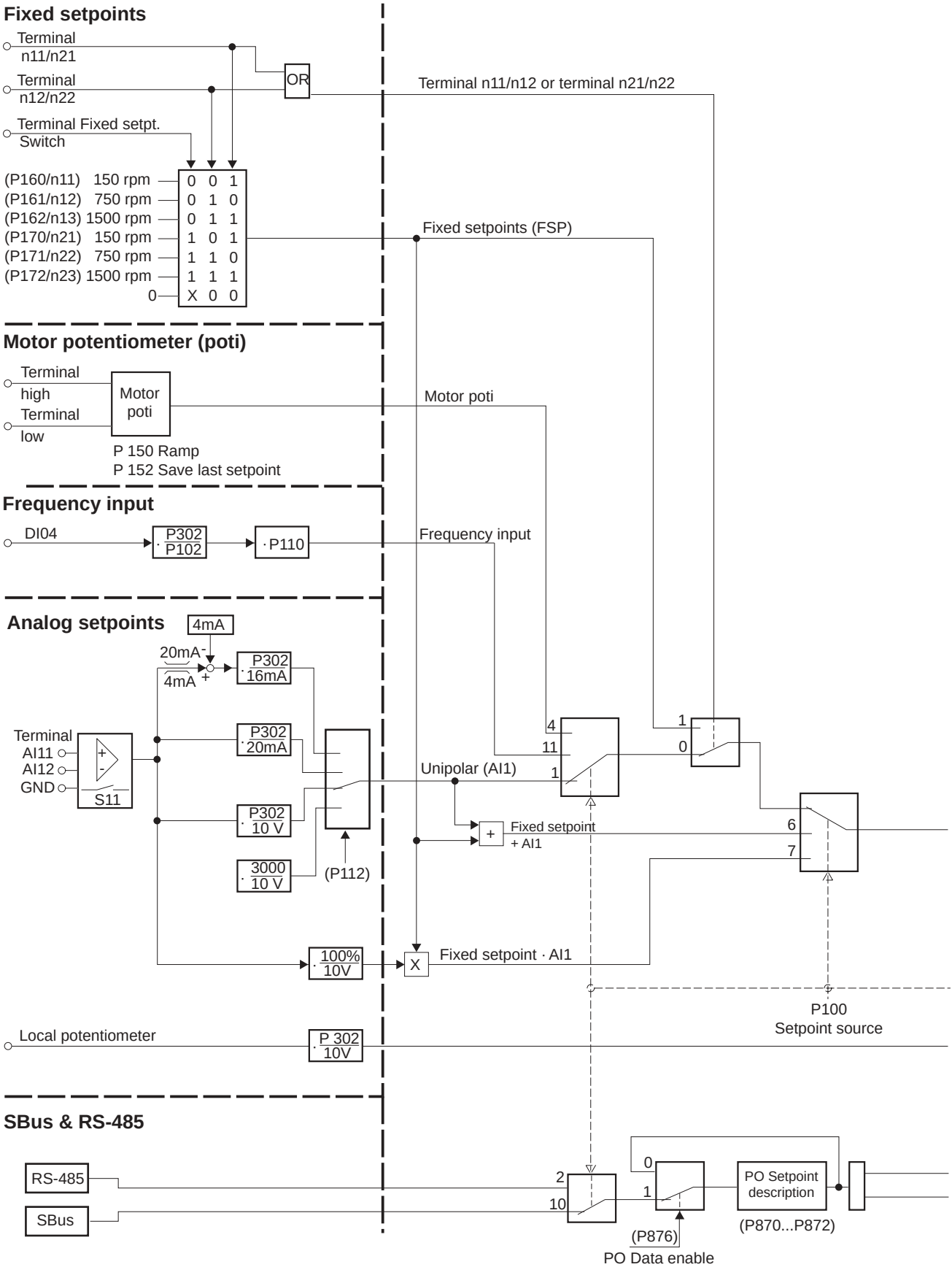

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Table 2: Important parameters and their default settings

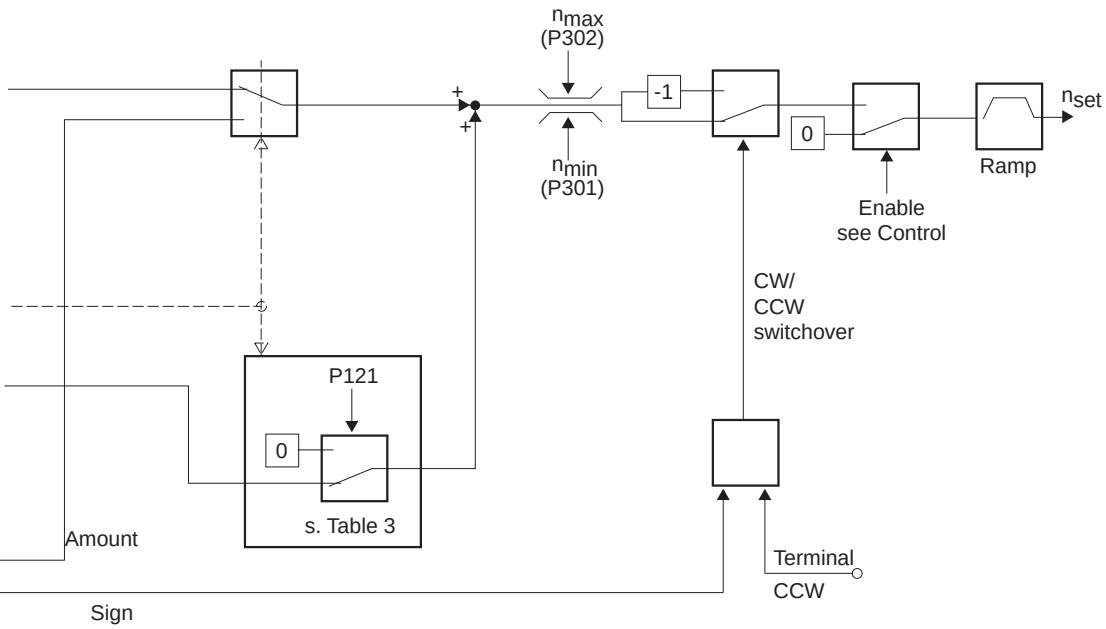
Parameter	Name	Default	Unit
P100	Setpoint source	UNIPOL/FIX.SETPT	
P102	Frequency scaling	10	kHz
P110	AI1 scaling	1	
P112	AI1 operating mode	0 ... 10 V → 0 ... n_{max}	
P301	Minimum speed	15	rpm
P302	Maximum speed	1500	rpm

Table 3: Addition of the installed setpoint potentiometer (poti) via parameter P121 = 1 (1 and 2)

P100 Setpoint source (P121 = Off = 0)	Value P100	Firmware .10 ... .12 std. (P121 = On)	Firmware as of .13 std. / .12 LD (P121 = On = 1)	Firmware as of .15 std. / .16 LD (P121 = 2)
UNIPOL/ FIX.SETPT	1	AI1 + Poti / FSP	AI1 + Poti / FSP + Poti	AI1 + Poti / FSP
Fix. setp. + AI1	6	FIX SETP+AI1	FIX SETP+AI1	FIX SETP+AI1
Fix. setp. * AI1	7	FIX SETP *+AI1	FIX SETP *+AI1	FIX SETP *+AI1
Motor potentiometer	4	Motor potentiometer / FSP	Motor potentiometer / FSP + potentiometer	Motor potentiometer / FSP
RS485	2	RS485 + Poti	RS485 + Poti	RS485 + Poti
SBus	10	SBus + Poti	SBus + Poti	SBus + Poti
Frequency input	11	not installed	Frequency + Poti / FSP + Poti	Frequency + Poti / FSP

(Firmware identification: standard → std; LogoDrive → LD)

The installed setpoint potentiometer will always be active (independent of P121) with activated PI controller as long as no FSP is selected.



6.5 Status word definition

The status word is 16 bits wide. The less significant byte, the basic status block, consists of eight status bits with fixed definition that reflect the most important drive states. The assignment of the more significant status bits varies for different status words.

Bit	Status	Assignment
0	Enable output stage	0 = Output stage blocked (high impedance) 1 = Output stage enabled
1	Inverter ready	0 = Inverter not ready (e. g. error) 1 = Inverter ready
2	PO data enabled	0 = PO data blocked 1 = PO data enabled
5	Fault/warning	0 = No fault/warning 1 = Fault/warning exists

Message Inverter ready

The value inverter ready = 1 in status bit 1 of the status word indicates that the inverter is ready to respond to control commands from an external control. The inverter is not ready, if

- MOVITAC® 07 reports an error
- the factory setting is active (setup)

Message PO data enabled

Status bit 2 indicates with PO data enabled = YES that the inverter responds to control or setpoint values from the communication interfaces (RS-485 or SBus). The following figure shows the conditions that have to be met for the PO data to be enabled:

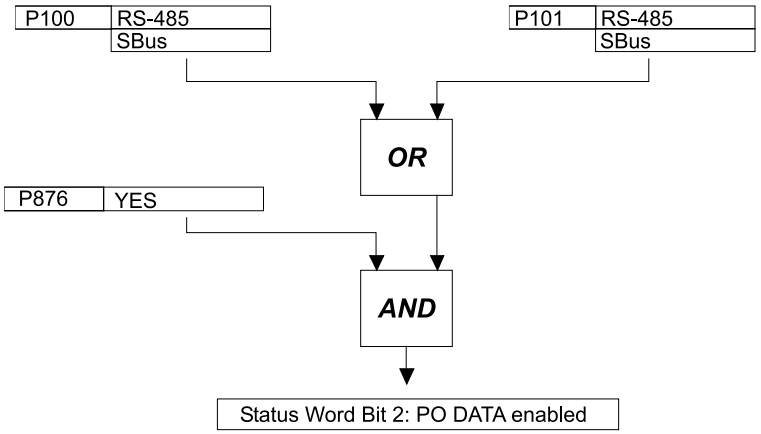


Figure 20: Definition of status word bit 2: PO data enabled

Fault/warning

The inverter reports a possible fault or warning in bit 5 of the status word. A fault generally causes the inverter to cease operation, while a warning may only be temporary without influencing the inverter behavior. That is why you should also evaluate status bit 1: *Ready for operation* to determine the exact reason for a fault.

Bit 1: Ready for operation	Bit 5: Fault/warning	Meaning
0	0	Inverter not ready for operation
0	1	Problem
1	0	Inverter is ready for operation
1	1	Warning

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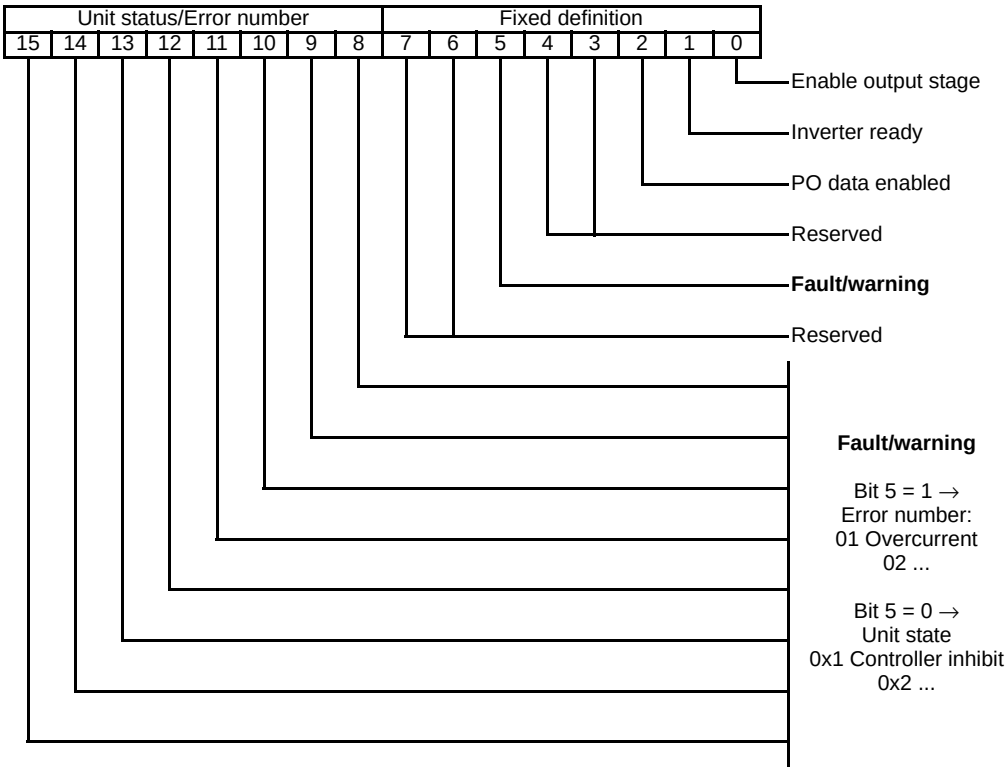
Status word 1

Status word 1 contains the status information in the basic status block and the **unit status** or the **error number** in the more significant status byte. Depending on the fault bit, the unit status is displayed in case of fault bit = 0 or in case of problems (fault bit = 1), the error number. The fault bit will be reset by resetting the fault and the current unit status is displayed. The meaning of the error numbers and the unit status is described in the system manual or in the MOVITRAC® 07 operating instructions.



Codes for unit status

Status word 1 lets you read the unit status of the MOVITRAC® 07:

- 0x0 Not ready
- 0x1 Controller inhibit
- 0x2 No enable
- 0x3 Standstill current active, no enable
- 0x4 Enable
- 0x5 Factory setting is active

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7 Operation and Service

7.1 Startup SBus

- **No communication on the SBus: Timeout or no response**
  1. SBus cable incorrect or not connected.
  2. System bus high and system bus low reversed.
  3. Not all stations are communicating at the same baud rate: Setting using parameter P816.
  4. Terminating resistors were not switched on or not switched on correctly (S12).
  5. Collisions on the SBus because several stations are sending a transmit telegram with the same ID.
  6. SBus cable too long (max. 80 m at 500 kbaud).
  7. Incorrect setting of SBus address or SBus group address.

- **Unit error F47: TIMEOUT SBUS**
  1. The unit is enabled and no process data are received via the SBus. → **Remedy:** Cyclical sending of process data.
  2. The unit is enabled and no process data are received via the SBus within the SBus timeout delay; the SBus timeout response has been programmed for a response with fault. → **Remedy:** Increase SBus timeout delay.
  3. → No communication on the SBus.

- **The data content of the variable objects is represented incorrectly.**

  Check the data format. Note the difference between the MOTOROLA and the INTEL formats.

- **The MOVILINK® transmission is being disrupted by the exchange of variables via IPOS$^{plus®®}$.**

  Identifiers used for the variable transmission have already been used for the MOVILINK® transmission.

- **Some variable objects cannot be sent or received.**

  Identifiers used for the variable transmission have already been used for the MOVILINK® transmission.

- **Acyclical variable transmission does function although acycliical variable transmission does not.**

  The cyclical variable objects and the receive objects must be started with the SCOMON command.

- Check the SBus connection.

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7.2 Return codes for parameter setting

In the event of an incorrect parameter setting, the inverter sends back various return codes to the master that set the parameters. These codes provide detailed information about the cause of the error. All of these return codes are structured in accordance with EN 50170. The system distinguishes between the following elements:

- Error class
- Error code
- Additional code

You will find a description of the errors in the MOVITRAC® 07 operating instructions and system manual.

These return codes apply to all MOVITRAC® 07 communication interfaces.

Error class

The error class element classifies the type of error more precisely. EN 50170 defines the following different error classes.

Class (hex)	Designation	Meaning
1	vfd-state	Status error of the virtual field unit
2	application-reference	Error in application program
3	definition	Definition error
4	resource	Resource error
5	service	Error when performing service
6	access	Access error
7	ov	Error in object list
8	other	Other error (see additional code)

The error class is generated by the communication software of the fieldbus gateway if there is an error in communication. This statement does not apply to "Error class 8 = Other error". Return codes sent from the inverter system are all in "Error class 8 = Other error". The error can be more precisely identified using the additional code element.

Error code

The error code element provides a means for more precisely identifying the cause of the error within the error class. It is generated by the firmware module responsible for communication in the event of an error in communication. For "Error class 8 = Other error", only "Error code = 0 (Other error code)" is defined. In this case, detailed identification takes place in the additional code.

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Additional code

The additional code contains the return codes specific to SEW dealing with incorrect parameter settings of the inverter. These codes are returned to the master under "Error class 8 = Other error". The following table shows the possible codings for the additional code.

Add. code high (hex)	Add. code low (hex)	Meaning
00	00	No error
00	10	Invalid parameter index
00	11	Function/parameter not implemented
00	12	Read access only
00	13	Parameter lock is active
00	14	Factory setting is active
00	15	Value too large for parameter
00	16	Value too small for parameter
00	18	Error in system software
00	1B	Parameter has access protection
00	1C	Controller inhibit required
00	1D	Invalid value for parameter
00	1F	Parameter was not saved in EEPROM
00	20	Parameter cannot be changed with enabled output stage

Special case "Internal communication error"

The return code listed in the following table is sent back if a communication error has occurred between the fieldbus gateway and the inverter.

The parameter adjustment service transmitted via the fieldbus may not have been performed and should be repeated. If this error reoccurs, it is necessary to switch off the inverter completely and then back on again so it is re-initialized.

	Code (dec)	Meaning
Error class:	6	Access
Error code:	2	Hardware fault
Add. code high:	0	–
Add. code low:	0	–

Correcting the fault

Repeat the read or write service. If this error occurs again, switch the inverter off completely and back on again. Contact the SEW Electronics Service for advice if this error occurs continuously.

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8 Monitoring Functions

For safe operation of the MOVITRAC® 07 inverter via the communication interfaces, additional monitoring functions have been implemented that may trigger an operator-defined drive function in case of a bus error. The following parameter is available for each communication interface.

- Timeout delay

This parameter defines an application-specific drive behavior in case of a communication error.

8.1 Timeout error

The inverter generates a timeout if no new data are received via the bus system within a preset time frame (timeout delay).

System bus:	F 47	TIMEOUT SBUS

The timeout delay for the sytem bus communication interface can be set.

System bus:	815	SBus timeout delay	[s]	0 (factory setting)

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9 Bus Diagnostics

The MOVITRAC® 07 inverter offers a variety of diagnostic information for fieldbus operation. These diagnostic options include the process data description parameters as well as the menu are P094 – P096 with the parameter for bus diagnostics with the installed operating device.

This chapter mainly explains the parameters for bus diagnostics as well as the bus monitor integrated in the MOVITOOLS® software package.

9.1 Diagnostics of process input data and output data

Incorrect inverter behavior is usually caused by errors in the application program. This means that the higher-level control sends incorrect control information or setpoints to the inverter. It is often important to find out the control information and setpoints received and sent by the inverter. Convenient fieldbus master connections offer simple diagnostic options, such as LED panels on the front cover that let you diagnose the individual process data of the fieldbus.

For simple access to these control and setpoints values, the MOVITRAC® 07 inverter offers the fieldbus monitor parameters for direct access to the process data received and send by the fieldbus system.

- P094 PO1 Setpoint (hex)
- P095 PO2 Setpoint (hex)
- P096 PO3 Setpoint (hex)
- P097 PI1 Actual value (hex)
- P098 PI2 Actual value (hex)
- P099 PI3 Actual value (hex)

P097 / P098 / P099 with MOVITOOLS only.

The process data received and sent by the inverter will be forwarded via the serial interface to the integrated operating panel or SHELL PC program.

You can preset setpoints without connected PLC with the bus monitor in control mode; the bus monitor also serves for the very clear observation of the transmitted setpoints and actual values.

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Even though not all process data cycles will be visible due to different transmission rates, experience has shown that this diagnostic option is still helpful.

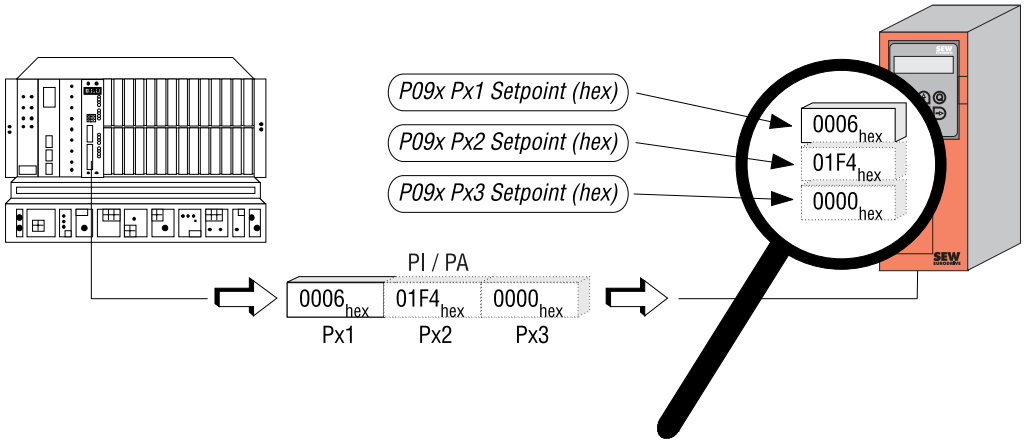

Figure 21: Diagnostics of process input/output data with MOVITRAC® 07

These fieldbus monitor parameters help you control all process data in hexadecimal form with the integrated operating panel of the inverter. The SHELL PC program even offers the profile-specific interpretation of process data, such as the display of speed set-points in the unit [1/min].

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10 Parameter List

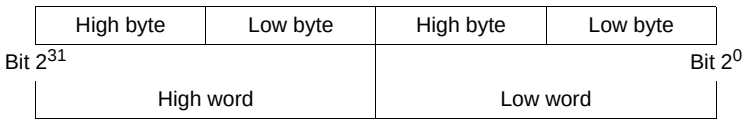
10.1 Explanation of the table header

The meanings of the entries in the table header are as follows:

Par. No.	= Parameter number used in MOVITOOLS/SHELL or the integrated operating panel.	
Parameter	= Parameter name	
Index	= 16-bit index for addressing the parameter via interfaces. Notation in decimal (= dec) and hexadecimal (= hex) format.	
Unit/index	= Unit index according to the sensor/actuator profile of the PNO.	Abbr. = Abbreviation of the unit of measurement Cv. = Conversion index (e.g. –3 = 10^{-3})
Access	= Access attributes	S = Save even with parameter lock RO = Read only R = Controller inhibit must be active when writing RW = Read/write N = The value is written from the EEPROM into the RAM during a restart
Default	= Factory setting	
Meaning/ value range	= Meaning and value range of the parameter	

Data format

All parameters are treated as 32-bit values. Representation in Motorola format.



MOVILINK® parameters

The parameters are arranged so that they are located in the proprietary area of the drive profiles (DRIVECOM-INTERBUS, CANopen, etc.). That means the area for the indices of the MOVILINK® parameters is as follows:

2000_{hex} (= 8192_{dec}) $5FFF_{hex}$ (= 24575_{dec})

Start index	Number of indices	Contents
11000	512	IPOS variables (11000 + IPOS variable number)
16000	1024	IPOS program code

The Ctrl + F1 key combination calls up the index number of every selected parameter in MOVITOOLS/SHELL.

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10.2 Conversion index

The conversion values should be used as follows:

(Physical value in multiples or fractions of the unit) =
(Transferred value × Unit) × A

Example:
Transferred via the bus:

Numerical value	Conversion index
1500	–3

The recipient assigns the following values to these figures:

4 → Measured quantity 'Time'
–3 → Unit of measurement 'Milliseconds'
→ 1500 ms = 1500 s × A + B = 1500 s × 0.001 + 0 s = 1.5 s

Example

Numerical value	Conversion index A
1 500 000	1 E^{-3} / 60

Value = Numerical value × A = 1 500 00 × 1 E^{-3} / 60 = 25

Conversion index from the PNO sensor/actuator profile

Conversion index	A (conversion factor)	1/A (reciprocal conversion factor)	B (offset)
0	1.E+0	1.E+0	0
–3	0.001 = 1.E–3	1.E+3	0
66	1.E–3/60 = 1.667 E–5	6.000 E+4	0

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10.3 Complete parameter list, sorted by parameter numbers

Note that the following parameter list applies to the MOVITRAC® 07 inverters.

Par. No.	Parameter	Index		Unit/index		Access	Default	Meaning / value range
		Dec	Hex	Abbr.	Cv.			
0.. Display values								
00. Process values								
000	Speed	8318	207E	1/s	66	RO	0	
002	Frequency	8319	207F	Hz	–3	RO	0	
004	Output current	8321	2081	%	–3	RO	0	
005	Active current	8322	2082	%	–3	RO	0	
008	DC link voltage	8325	2085	V	–3	RO	0	
009	Output current	8326	2086	A	–3	RO	0	
01. Status displays								
010	Inverter status	8310	2076		0	RO	0	Low word coded as status word 1
011	Operational status	8310	2076		0	RO	0	
012	Fault status	8310	2076		0	RO	0	
014	Heat sink temperature	8327	2087	°C	0	RO	0	
02. Analog setpoints								
020	Analog input AI1	8331	208B	V	–3	RO	0	
03. Binary inputs basic unit								
032	Binary input DI02	8336	2090		0	N/R/RW	3	0 ... 12, Step 1
033	Binary input DI03	8337	2091		0	N/R/RW	1	0 ... 12, Step 1
034	Binary input DI04	8338	2092		0	N/R/RW	4	0 ... 12, Step 1
035	Binary input DI05	8339	2093		0	N/R/RW	5	0 ... 12, Step 1
036	Binary inputs DI01.. DI05	8334	208E		0	N/R/RW	0	Bit 1 = DI01 ... Bit 5 = DI05
05. Binary outputs basic unit								
051	Binary output DO01	8350	209E		0	N/RW	1	0 ... 11, Step 1
052	Binary output DO02	8351	209F		0	N/RW	5	0 ... 11, Step 1
053	Binary outputs DO01/2	8349	209D		0	RO	0	Bit 1 = DO01, Bit 2 = DO02
07. Unit data								
070	Unit type	8301	206D		0	RO	0	
071	Rated output current	8361	20A9	A	–3	RO	0	
076	Firmware basic unit	8300	206C		0	RO	0	Example: 822609711 = 822 609 7.11 1822609011 = 822 609 X.11

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Par. No.	Parameter	Index Dec	Index Hex	Unit/index Abbr.	Unit/index Cv.	Access	Default	Meaning / value range
08. Fault memory time t-x								
080	Fault t-0	8366	20AE		0	N/RO	0	
	Input terminals	8371	20B3		0	N/RO	0	Bit 1 = DI01 ... Bit 5 = DI05
	Output terminals	8381	20BD		0	N/RO	0	Bit 1 = DO01, Bit 2 = DO02
	Operational status	8391	20C7		0	N/RO	0	Low word coded as status word 1
	Heat sink temperature	8396	20CC	°C	0	N/RO	0	
	Speed	8401	20D1	1/s	66	N/RO	0	
	Output current	8406	20D6	%	–3	N/RO	0	
	Active current	8411	20DB	%	–3	N/RO	0	
	Unit utilization	8416	20E0	%	–3	N/RO	0	
	DC link voltage	8421	20E5	V	–3	N/RO	0	
09. Bus diagnostics								
094	PO1 setpoint	8455	2107		0	S/RO	0	
095	PO2 setpoint	8456	2108		0	S/RO	0	
096	PO3 setpoint	8457	2109		0	S/RO	0	
097	PI1 actual value	8458	210A		0	RO	0	
098	PI2 actual value	8459	210B		0	RO	0	
099	PI3 actual value	8460	210C		0	RO	0	
1.. Setpoints/integrators								
10. Setpoint selection								
100	Setpoint source	8461	210D		0	N/R/RW	1	1 = UNIPOL/FIX.SETPT 2 = RS-485 4 = MOTOR POT 6 = FIX SETP+ANALOG1 7 = FIX SETP*ANALOG1 10 = SBus 11 = Frequency input
101	Control signal source	8462	210E		0	N/R/RW	0	0 = TERMINALS 1 = RS-485 3 = SBus 4 = 3-Wire-Control
102	Frequency input	8840	2288	kHz	3	11	10	0.1 ... 65.00
11. Analog input AI1								
110	AI1 scaling	8463	210F		–3	N/RW	1000	–10000 ... –0, Step 10 0 ... 10000, Step 10
112	AI1 operating mode	8465	2111		0	N/RW	1	0 = Ref. 3000 1/min 1 = Ref. N-MAX 5 = N-MAX, 0-20mA 6 = N-MAX, 4-20mA
12. Setpoint potentiometer								
121	Addition Setpoint Potentiom.	8811	226B		0	N/RW	0	0 = OFF 1 = ON 2 = ON EXCEPT FSP
122	Local Potentiometer Mode	8799	225F		0	N/RW	0	0 = UNIPOL. CW 1 = UNIPOL. CCW 2 = BIPOLAR CW +CCW

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Par. No.	Parameter	Index Dec	Index Hex	Unit/index Abbr.	Unit/index Cv.	Access	Default	Meaning / value range
13. Speed ramps 1								
130	Ramp t11 UP CW	8807	2116	s	–3	N/RW	2000	0 ... 1000, Step 10 1000 ... 10000, Step 100 10000 ... 100000, Step 1000 100000 ... 2000000, Step 10000
131	Ramp t11 DOWN CW	8808	2117	s	–3	N/RW	2000	0 ... 1000, Step 10 1000 ... 10000, Step 100 10000 ... 100000, Step 1000 100000 ... 2000000, Step 10000
136	Stop ramp t13	8476	211C	s	–3	N/RW	2000	0 ... 1000, Step 10 1000 ... 10000, Step 100 10000 ... 20000, Step 1000
138	Ramp limit	8794	225A		0	N/RW	0	0 = OFF 1 = ON
15. Motor potentiometer								
150	Ramp t3 UP	8809	2126	s	–3	N/RW	20000	200 ... 1000, Step 10 1000 ... 10000, Step 100 10000 ... 50000, Step 1000
152	Save last setpoint	8488	2128		0	N/RW	0	0 = OFF 1 = ON
16. Fixed setpoints 1								
160	Internal setpoint n11	8489	2129	1/s	66	N/RW	150000	–5000000 ... –0, Step 200 0 ... 5000000, Step 200
161	Internal setpoint n12	8490	212A	1/s	66	N/RW	750000	–5000000 ... –0, Step 200 0 ... 5000000, Step 200
162	Internal setpoint n13	8491	212B	1/s	66	N/RW	1500000	–5000000 ... –0, Step 200 0 ... 5000000, Step 200
	Internal setpoint n11	8489	2129	1/s	66	N/RW	150000	–5000000 ... –0, Step 200 0 ... 5000000, Step 200
	Internal setpoint n12	8490	212A	1/s	66	N/RW	750000	–5000000 ... –0, Step 200 0 ... 5000000, Step 200
	Internal setpoint n13	8491	212B	1/s	66	N/RW	1500000	–5000000 ... –0, Step 200 0 ... 5000000, Step 200
163	Internal setpoint n11 PI-controller	8814	226E	%			3	0 ... 100
164	Internal setpoint n12 PI-controller	8815	226F	%			15	0 ... 100
165	Internal setpoint n13 PI-controller	8816	2270	%			30	0 ... 100
17. Fixed setpoints 2								
170	Internal setpoint n21	8492	212C	1/s	66	N/RW	150000	–5000000 ... –0, Step 200 0 ... 5000000, Step 200
171	Internal setpoint n22	8493	212D	1/s	66	N/RW	750000	–5000000 ... –0, Step 200 0 ... 5000000, Step 200
172	Internal setpoint n23	8494	212E	1/s	66	N/RW	1500000	–5000000 ... –0, Step 200 0 ... 5000000, Step 200
	Internal setpoint n21	8492	212C	1/s	66	N/RW	150000	–5000000 ... –0, Step 200 0 ... 5000000, Step 200
	Internal setpoint n22	8493	212D	1/s	66	N/RW	750000	–5000000 ... –0, Step 200 0 ... 5000000, Step 200
	Internal setpoint n23	8494	212E	1/s	66	N/RW	1500000	–5000000 ... –0, Step 200 0 ... 5000000, Step 200
173	Internal setpoint n21 PI-controller	8817	2271	%			3	0 ... 100
174	Internal setpoint n22 PI-controller	8818	2272	%			15	0 ... 100
175	Internal setpoint n23 PI-controller	8819	2273	%			30	0 ... 100

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Par. No.	Parameter	Index Dec	Index Hex	Unit/index Abbr.	Unit/index Cv.	Access	Default	Meaning / value range
2.. Controller parameters								
25. PI controller								
250	PI controller	8800	2260			N/RW	0	0 = OFF 1 = ON STANDARD 2 = ON INVERTED
251	P-gain	8801	2261			N/RW	1	0 ... 64
252	I component	8802	2262	s	0	N/RW	1	0 ... 2000
253	PI actual value mode	8465	2111			N/RW	1	1 = 0 ... 10 V 5 = 0 ... 20 mA 6 = 4 ... 20 mA
254	PI actual value scaling	8463	210F				1	0.1 ... 10
255	PI actual value offset	8812	226C	%			0	0 ... 100
3.. Motor parameters								
30. Limits 1								
301	Minimum speed	8516	2144	1/s	66	N/RW	60000	0 ... 5500000, Step 200
302	Maximum speed	8517	2145	1/s	66	N/RW	1500000	0 ... 5500000, Step 200
303	Current limit	8518	2146	%	–3	N/RW	150000	0 ... 150000, Step 1000
32. Motor compensat. 1 (asynchr.)								
320	Automatic adjustment	8523	214B		0	N/RW	1	See menu no. 152 or index 8488
321	Boost	8524	214C	V	–3	N/RW	0	0 ... 100000, Step 1000
322	IxR compensation	8525	214D	V	–3	N/RW	0	0 ... 100000, Step 1000
323	Premagnetizing time	8526	214E	s	–3	N/RW	100	0 ... 2000, Step 1
324	Slip compensation	8527	214F	1/s	66	N/RW	0	0 ... 500000, Step 200
4.. Reference signals								
40. Speed reference signal								
400	Speed reference value	8539	215B	1/s	66	N/RW	1500000	0 ... 5000000, Step 200
401	Hysteresis	8540	215C	1/s	66	N/RW	100000	0 ... 500000, Step 1000
402	Delay time	8541	215D	s	–3	N/RW	1000	0 ... 9000, Step 100
403	Signal = "1" if:	8542	215E		0	N/RW	0	0 = n < n ref 1 = n < n ref
5.. Monitoring functions								
50. Speed monitoring								
500	Speed monitoring 1	8557	216D		0	N/RW	3	0 = OFF 3 = MOT.& REGEN.MODE
501	Delay time 1	8558	216E	s	–3	N/RW	1000	0 ... 10000, Step 10
6.. Terminal assignment								
60. Binary inputs basic unit								
601	Binary input DI02	8336	2090		0	N/R/RW	3	0 = NO FUNCTION 1 = ENABLE/STOP 2 = CW/STOP 3 = CCW/STOP 4 = n11/n21 5 = n12/n22 6 = FIX SETPT. SELECT 9 = MOTOR POT UP 10 = MOTOR POT DOWN 11 = EXT. FAULT 12 = FAULT RESET 16 = IPOS input (LOGODrive only) 20 = SETPOINT HOLD 32 = CONTROL.INHIBIT
602	Binary input DI03	8337	2091		0	N/R/RW	1	See menu no. 601 or index 8336
603	Binary input DI04	8338	2092		0	N/R/RW	4	See menu no. 601 or index 8336
604	Binary input DI05	8339	2093		0	N/R/RW	5	See menu no. 601 or index 8336 additional: 26 = TF SIGNAL

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Par. No.	Parameter		Index Dec	Index Hex	Unit/index Abbr.	Unit/index Cv.	Access	Default	Meaning / value range
62. Binary outputs basic unit									
620	Binary output DO01		8350	209E		0	N/RW	2	0 = NO FUNCTION 1 = /FAULT 2 = READY 3 = OUTP. STAGE ON 4 = ROT. FIELD ON 5 = BRAKE RELEASED 9 = SPEED REFERENCE 11 = SP/ACT.VAL.COMP. 21 = IPOS OUTPUT (LOGODrive only) 22 = /IPOS OUTPUT (LOGODrive only) 23 = PI ACTUAL VALUE REFERENCE
621	Binary output DO02		8351	209F		0	N/RW	1	See menu no. 620 or index 8350
7.. Control functions									
70. Operating modes									
700	Operating mode 1		8574	217E		0	N/R/RW	0	0 = VFC 1 2 = VFC 1 & HOIST 3 = VFC 1 & DC BRAK. 4 = VFC 1 &FLY.START 21 = V/f character. 22 = V/f character. & DC BRAKE
71. Current at standstill									
710	Standstill current 1	[%Imot.]	8576	2180	A	–3	N/RW	0	0 ... 50000, Step 1000
72. Setpoint stop function									
720	Setpoint stop function 1		8578	2182		0	N/RW	0	See menu no. 152 or index 8488
721	Stop setpoint 1	[1/min]	8579	2183	1/s	66	N/RW	30000	0 ... 500000, Step 200
722	Start offset 1	[1/min]	8580	2184	1/s	66	N/RW	30000	0 ... 500000, Step 200
73. Brake function									
736	Braking time		8828	227C	s	0	N/RW	0.1	0 ... 2
8.. Unit functions									
80. Setup									
802	Factory setting		8594	2192		0	R/RW	0	0 = NO 1 = YES
803	Parameter lock		8595	2193		0	N/S/RW	0	See menu no. 152 or index 8488
804	Reset statistic data		8596	2194		0	RW	0	0 = NO 1 = FAULT MEMORY
81. Serial communication									
810	RS485 address		8597	2195		0	N/RW	0	0 ... 99, Step 1
811	RS-485 group address		8598	2196		0	N/RW	100	100 ... 199, Step 1
812	RS485 timeout delay	[s]	8599	2197	s	–3	N/RW	0	0 ... 650000, Step 10
813	SBus address		8600	2198		0	N/RW	0	0 ... 63, Step 1
814	SBus group address		8601	2199		0	N/RW	0	0 ... 63, Step 1
815	SBus timeout delay	[s]	8602	219A	s	–3	N/RW	100	0 ... 650000, Step 10
816	SBus baud rate	[kBaud]	8603	219B		0	N/RW	2	0 = 125 1 = 250 2 = 500 3 = 1000
82. Brake operation									
820	4-quadrant operation 1		8607	219F		0	N/RW	1	See menu no. 152 or index 8488
83. Error responses									
830	Response EXT. FAULT		8609	21A1		0	N/RW	3	2 = IMM. STOP/FAULT 4 = RAPID STOP/FAULT
84. Reset response									
840	Manual reset		8617	21A9		0	S/RW	0	See menu no. 802 or index 8594
86. Modulation									
860	PWM frequency 1	[kHz]	8620	21AC		0	N/RW	0	0 = 4 1 = 8 2 = 12 3 = 16
862	PWM fix 1		8751	222F		0	N/RW	0	See menu no. 152 or index 8488

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87. Process data description								
870	Setpoint description PO1	8304	2070		0	N/RW	9	0 = NO FUNCTION 1 = SPEED 5 = MAX. SPEED 8 = RAMP 9 = CTRL. WORD 1 10 = CTRL. WORD 2 (LOGODrive only) 11 = SPEED [%] 12 = IPOS PO DATA (LOGODrive only) 13 = PI CONTROLLER SETPOINT
871	Setpoint description PO2	8305	2071		0	N/RW	1	See menu no. 870 or index 8304
872	Setpoint description PO3	8306	2072		0	N/RW	0	See menu no. 870 or index 8304
873	Actual value description PI1	8307	2073		0	N/RW	6	0 = NO FUNCTION 1 = SPEED 2 = OUTP.CURRENT 3 = ACTIVE CURR. 6 = STATUS WORD1 8 = SPEED [%] 9 = IPOS PI DATA (LOGODrive only) 10 = PI CTRL [%]
874	Actual value description PI2	8308	2074		0	N/RW	1	See menu no. 873 or index 8307
875	Actual value description PI3	8309	2075		0	N/RW	2	See menu no. 873 or index 8307
876	PO data enable	8622	21AE		0	N/S/RW	1	See menu no. 152 or index 8488
9.. IPOSparameters								
93. IPOS Special functions								
930	Override	8637	21BD		0	N/RW	0	See menu no. 152 or index 8488
931	Task 1/2						0	0 = off 1 = on
932	Task 2						0	0 = off 1 = on

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